AMERICAN MACHINIST

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Sketch of the Life and Work of John C. Hoadley.

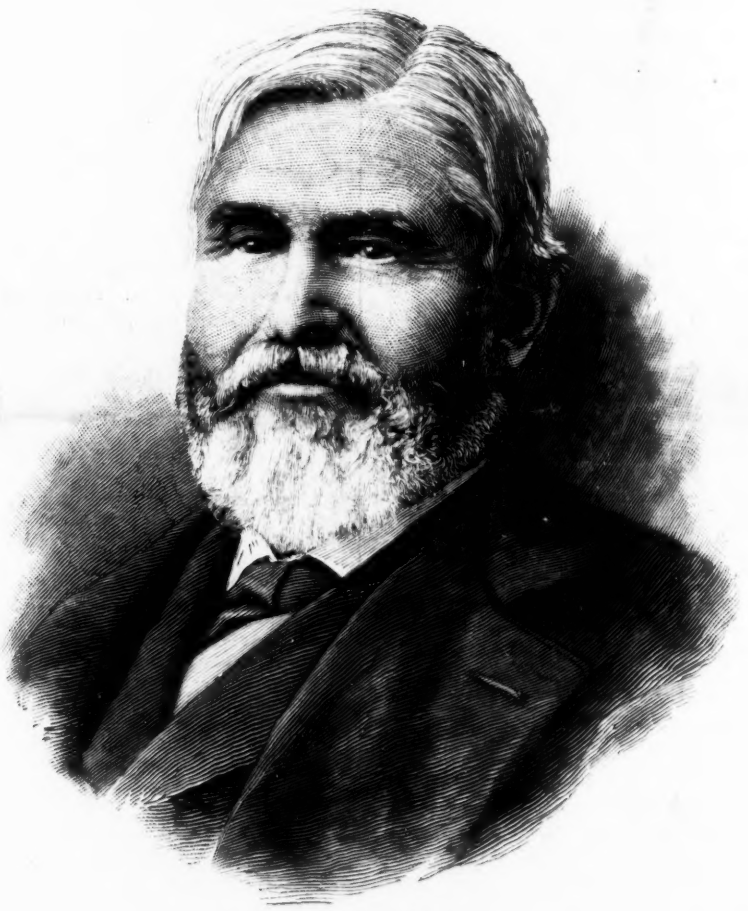
The decease of J. C. Hoadley removes one of the most eminent and useful mechanical engineers in this country. Two weeks ago we published a brief sketch of his career, and this week present a portrait engraved from a recent photograph. Six years ago Mr. Hoadley took quite an active interest in the organization of the American Society of Mechanical Engineers. All its members were asked to give sketches of their engineering experience, and the sketch then furnished by Mr. Hoadley we publsh herewith. It is dated March 29th, 1880:

"Born at Turin, Lewis county, New York, December 10th, 1818. Between the ages of fourteen and seventeen, worked about two years in a machine shop at wood and iron work. In the fall of the year 1835 was engaged a few months in a preliminary survey for a railway from Utica, N. Y., to Binghamton, under J. D. Allen. Attended the Utica Academy the following winter and made special studies of algebra, geometry, and surveying. In May, 1836, began as chainman, a long course of training in practical civil engineering on the enlargement of the Erie Canal, under Holmes Hutchinson, chief engineer; Squire Whipple, first assistant; and O. W. Storey, second assistant. During the summer, at intervals of field work, and after the close of such work in the fall, was kept employed in the office in Utica at drawing upon maps and plans.

"The following summer again engaged in field work, successively as rod man, leveler, surveyor, etc., etc., and in the fall, with O. W. Storey as my only assistant, in subordinate charge of work of enlargement at Syracuse, N. Y.

"I continued this employment, having in the year 1840 charge of a surveying party locating the line of the enlarged canal between Utica and Rome, until the suspension of work on the enlargement; and afterwards, with Edward H. Brodhead, as my only assistant, on the Black River Canal, the Chenango Canal, and the enlargement of the Erie Canal, between Little Falls and Syracuse; engaged in measuring quantities of work done on contracts, mostly unfinished; in surveying and computing the quantity of land taken for the enlargement, and in attendance upon the Canal Board and the Canal Appraisers on questions of damages.

"My experience upon this work embraced no little mechanical engineering, such as bridges, weigh locks, etc. On the last day of December, 1844, I quitted the service of the State of New York after more than eight and a half years of continuous employment, and on the first day of the year 1845 took charge, as civil engineer, of the extensive works then recently begun by Erastus B. Bigelow and his brother Horatio H. Bigelow, in the southerly part of the town of Lancaster, Worcester County, Mass., which has since been erected into the town of Clinton.



JOHN CHIPMAN HOADLEY.

"The works of three distinct companies were under my charge—the Lancaster Mills, the Clinton Company, and the Lancaster Quilt Company—and the work embraced dams, canals, wheel pits, water wheels, steam engine foundations, and steam engines, mills, dye houses, boiler houses, boiler settings, and chimneys, roads and streets, houses, churches, hotel, water works, etc.—a manufacturing village.

"I also did much mechanical drawing for Erastus B. Bigelow upon machines he was designing and inventing; and saw and examined, critically, a great variety of machinery, and became acquainted with many eminent machinists and familiar with their work, and to a certain extent with their shops. I need only name George H. Corliss, Thomas T. Hill, William Mason, and John C. Whitin.

"On the first day of November, 1848, I went from Lancaster to Pittsfield, Berkshire county, Mass., and became the partner of Gordon McKay, under the firm name of McKay & Hoadley, in a machine shop founded by Mr. McKay a few years earlier, and entered upon designing and constructing steam engines, water wheels, and general machinery. My particular duties embraced designing, drawing, and superintendence of the shop, to all which Mr. McKay also gave unremitting attention.

"In February, 1852, Mr. McKay and I left Pittsfield together upon the solicitation of the Essex Company, and went to Lawrence and took charge of the Lawrence Machine Shop—Mr. McKay as agent and soon afterwards as treasurer, and I as superintendent of the shop, a large concern, employing at times as many as 750 men.

"When in 1855 Mr. McKay retired from the management, I undertook, reluctantly, the duties of agent and general superintendent, and remained in that position until the shop was closed in 1857.

"While there I had a large corps of draftsmen in my employ, yet made many entire sets of drawings myself—drawings for wooden patterns to cast iron patterns from, drawings to finish the iron patterns by, and final drawings to finish the machines by. The work was of great variety—woolen and cotton machinery of all kinds, paper machinery, cordage machinery, printing presses, stationary steam engines of many sizes, locomotives, turbine and other water wheels, shafting, and many other general and special machines.

"In the year 1857 I began the manufacture, on my own account, of portable steam engines—a business which had grown to some importance, when it was interrupted by the outbreak of the War of the Rebellion in 1861. In February, 1862, I went to New Bedford, Mass., and took charge of the Copper Rolling Mill and other works of the New Bedford Copper Company, then nearly ready to start, leaving my own business in Lawrence under the care of a foreman and a clerk, who soon afterwards became my partners.

"In 1866 I left New Bedford, and for one year managed the business of the McKay Sewing Machine Association (in which I had acquired a very large interest) during Mr. McKay's absence in Europe, as his attorney, in fact, and as agent of the association.

"On his return in 1867 I returned to Lawrence, bought out my partners, and resumed the immediate care of my portable steam engine business, which I carried on until 1877, when, having sustained heavy losses (amounting to $250,000), my capital being inadequate to the proper prosecution of business, and so tied up as to be unavailable, for the time, for the payment of my debts, I gave up the business, and began practice as consulting engineer and scientific and mechanical expert.

"I have received the honorary degree of A. M. from Williams College, have been from its commencement one of the Board of Trustees of the Massachusetts Institute of Technology, and have been for seven years a member os the Massachusetts State Board of Health (and now of the State Board of Health, Lunacy and Charity) as the 'engineer' member of said Board."

One of the distinguishing traits of Mr. Hoadley's character was his willingness to help those who were striving to obtain a mechanical education. His readiness to assist and encourage young men seeking a knowledge of mechanical work is so well shown in an article entitled "Engineering Reminiscences," which he wrote for the AMERICAN MACHINIST, that we reproduce that article from our issue of January 8, 1881:

"In the year of grace 1847—what an old date!—more than a third of a century ago, I was engaged as civil engineer, with some of the duties of a mechanical engineer, in superintending the construction of mills and factories with their dams, canals and other appliances of water power, auxiliary steam power, and the streets, houses and public buildings of a manufacturing village, soon to grow into a separate town, in the interior of Massachusetts. A machine shop, under the skillful management of an excellent mechanic of sturdy character, employing three to four score workmen, of whom about one-fourth were apprentices, formed a part of the enterprise.

"The working hours were long, from six o'clock in the morning till half-past seven at night, with thirty minutes out for breakfast and forty minutes for dinner, with ten minutes additional in each case for 'washing up,' all tools meanwhile being kept running as far as possible. Among the apprentices was to be found almost every grade of ability, and a considerable range of education, from utter illiteracy to fair mastery of the branches of ordinary English education then taught in rural New England schools. One bright-eyed, rosy-cheeked English boy, good-looking, almost handsome, in spite of a hare-lip, whom I had picked out of a gang of laborers, digging knee deep in water for the foundation of a wheel pit, and who had been taken as an apprentice at my earnest and persistent

solicitation, could neither read nor write. Among the younger journeymen was a man of active, restless mind, envious rather than ambitious, jealous, but not emulous, known as one of those pestilent fanatics, a 'ten-hour-man.' He was a born agitator, and strove hard, but with slight success, to gain influence among his fellow workmen. Of course his economic views were little to the taste of his employers, but no one thought of his being molested on account of them; and the idea of his discharge for any such reason would have shocked the public conscience and the moral sense of employers and employed alike. And here I desire to say, by way of parenthesis, that in the course of forty years of intimate and confidential business intercourse with employers of labor in Massachusetts—part of the time myself a large employer—I never heard of a single instance of discharge, actual or threatened, of intimidation, solicitation or attempted influences, carried to a degree imcompatible with perfect freedom of opinion and action and entire self-respect, on the part of any proprietor, agent, superintendent or foreman, towards any workingman, touching his political or religious opinions or actions.

"To resume my story: One evening in midsummer, after 'bell-time,' three or four apprentices in the machine shop came to my office, where my duties generally kept me long after the more privileged 'workingmen' were abed and asleep, and asked me, with hesitation and timidity, if I would give some lessons in mechanical drawing to a class of about a dozen young men in the shop and mills. The cordial and sympathetic response they met seemed to give them no less surprise than pleasure; and they frankly avowed that they had been taught by their ten-hour workingman's friend to expect an angry rebuff. 'Of course,' said he, 'Mr. Engineer knows the value of an education, and won't be such a fool as to cheapen his own attainments by sharing them with you.' I hesitated a little, it is true, on account of severe illness in my family, foreboding the greatest bereavement of my life, but promised an answer the following evening.

"On stating the matter, as delicately and as deprecatingly as possible, to my invalid wife, she entered so heartily into the wishes of the young men, and urged my compliance with their request so eloquently, that I met them at the appointed time with a favorable answer, and a statement of terms and conditions. I was to give twenty-four lessons to a class of not less than ten, nor more than twelve, five evenings in each week, beginning at eight o'clock and ending when they pleased; I would stay as late as they would. My heart was enlisted in it; and who at thirty, knows what fatigue is? Each one was to bring a drawing board and a T-square of specified dimensions, two pencils, one hard, the other soft, a piece of India rubber, a ruler, a triangle—part of them with angles of 30, 60 and 90 degrees, part of 45 and 90; a pair of dividers, a six-inch scale, a bow-pen and bow-pencil, a drawing pen, and a candlestick and candle. All were to come with clean hands; to be prompt, attentive and diligent. Since they would be likely to care little for what cost them nothing, I required a payment of three dollars for the course from each; and my modest salary was not enough greater than their earnings to make this appear extortionate.

My modest room, crowded with twelve drawing-boards, lighted by twelve candles, toiled over by twelve sturdy young men, during three hours of warm, midsummer nights, was not a 'bower of pleasance.' There were windows on three sides of the room, so that the air was not so bad as might be supposed; but currents of air made the candles drip and gutter—moths and 'thieves' made them hiss and sputter; and the toil of holding a hexagonal pencil in unaccustomed fingers, and the responsibility of keeping moist palms off the white paper, drew from many an anxious brow more copious streams than ever followed the most energetic use of the chipping hammer, emery stick, or file.

"I had selected simple subjects for each to copy—some on the same scale, some on a reduced scale, and some with omissions, additions or variations. I gave them, at first, some general instructions, and went around from one to another, to show and to teach them how to hold dividers, scale, pencil; how to sharpen a pencil, how to draw lines—the very rudiments of the simplest kind of drawing.

"Some had nimble fingers, a dexterous touch, and made neat and accurate drawings of simple subjects from the first; some blotted and defaced their paper for several lessons, but all made progress, and for the most part their improvement was surprisingly rapid. Had I stood in need of a draftsman, there were several who would have been of real service to me before the course was ended.

"The chances and changes of life during a third of a century have dispersed the members of this class; some are dead; there were as many degrees of success as there were of natural ability and antecedent preparation. Some had such application and such native parts, that circumstances could only have retarded, never have repressed, their rising to positions of usefulness. But all were benefited, and many have expressed to me their sense of the benefit in a touching manner. One, whom I am happy to count among my most valued friends, is at the head of the mechanical department of one of the greatest industrial establishments in the country, enjoys in the highest degree the confidence of his employers, the respect of his fellow-citizens, and the amenities of social life in a home of elegance and refinement. It was my good fortune to have helped him at the start, but his clear mind and tireless energy must have gained recognition under any circumstances. This is doubtless true of others, but the English boy with a hare-lip most clearly showed the good effects of this slight assistance, and gave touching evidence of his appreciation of it.

"Several years after I left the scene of this little incident and had engaged in manufacturing machinery on my own account, I revisited the thriving town, which had grown from the germ I had seen planted.

"At one of the larger mills I found my English friend grown to a sturdy man, with a blonde mustache covering his hare-lip. His bright, expressive hazel eyes beamed with pleasure on meeting me, and he wrung my hand almost hard enough to start the blood from the nails. Drawing me aside he told me that he had been for years a repair hand in the mill where he then was, at good wages with steady work; that he was happily married, and had three fine children and a pleasant home with every comfort that heart could wish. 'And for all, thanks to you!' He had always intended to make me a present of his first savings, and then had three hundred dollars saved expressly for me, which he begged me to accept. Of course I was touched, but told him, as delicately as possible, that I could not take his hoarded earnings for a service already doubly paid—first by the stipulated fee; and again, and indeed many times, by the satisfaction I feel in the remembrance of it. I requested him to deposit the sum he named in a savings bank for his children, and, if he insisted, in memory of me. With eyes brim full of tears, a voice choked beyond the power of utterance, and a still more excruciating squeeze of my hand, he assented, and I left him.

"Again I saw him, at the same mill, only a few years ago. More than twenty years had passed, he had grown old, and stout and gray, but looked prosperous and respectable—and was engineer in charge of two large Corliss steam engines, which silently testified by their perfect order to his faithful care. After a little chat, I inquired about his family. At the word his countenance fell, his eyes filled with tears, and his voice faltered, as he said:

"'All gone! All, all gone!' And he, poor fellow, soon followed them, as did my dear and valued friend, the agent of the mills, who then stood beside me.

"But most of my pupils still live; all are in places of respectability and usefulness, and I count each one a friend."

Natural and Artificial Gas.

The usual Board of Trade of a city is a body more ornamental than useful. This cannot be said of the Board of Trade of Scranton, Pa. This last named body occasionally issues a report, and there is almost invariably something in it that is worthy of notice. Primarily it is intended to be in the interest of Scranton, but it is also of interest to others. The report for 1886, now before us, treats the fuel question, especially with reference to gas fuel, and the vast accumulation of culm. Referring to natural gas, the report says:

Like many another thing natural gas is no new discovery. It dates back before the Christian era, and the Chinese observed it 3,000 years ago, and have obtained supplies in the Tsien Luon Tsing, from wells 3,000 feet deep. * * * Its distribution is very wide over the known world, and it is materiallly the same in China, on the Caspian Sea, and in America. It is by no means a mysterious visitor, yet its late arrival in such quantities as are developed in the southwest of the State has occasioned surprise. Its intrinsic value will consist in its quantity and its persistence of pressure; both of which qualities are already becoming very much involved in apprehension or in doubt.

Could any locality be assured of an unfailing and an indefinite supply of natural gas, it would undoubtedly possess ideal attractions to domestic and industrial life. Were it not for its fitful stages, both in regard to quality and to exhaustion, it might possess a most determined future; but every record and the accumulation of experience, with some rare exceptions, serve to foretell the period of its existence. "Its life is short," seems written over every gas district.

The report also quotes Professor Lesley's opinion that the supply of natural gas will not last for many years. Interesting figures are given as to the amount of culm or waste coal, as follows:

The quantity of this material cannot be clsely estimated. It has already reached millions upon millions of tons, and it lies upon every hand in great mountain piles, and can be had for the taking. The total yield of the Lackawanna Valley, since anthracite mining began in 1829, and carried to a foreign as distinguished from a home market, has reached the enormous total of 167,109,600 tons. To these figures add, say 40,000,000 tons of home consumption, and we have upwards of 200,000,000 tons. Waste may be variously estimated; but, taking the early wasteful, as well as the later more economical period into consideration, there cannot be less than 20 per cent, or about 40,000,000 tons of this valuable fuel now lying above ground.

Allowing one-half of the amount of this tonnage to be waste, by the weathering of the coal, by use in filling and grading, and by firing at the culm bank, and we have yet 20,000,000 tons; and we are increasing the amount yearly by a volume of 2,000,000 tons, an aggregate of natural substance going to waste unheard of and unparalleled.

The cost of artificial gas made from this waste is thus given:

The contemplation of the gas subject in the anthracite coal fields is almost like an Aladdin story. In scientific nomenclature, it may probably be designated as anthracite gas. Based upon the foregoing calculations, we have the cost per ton at the producer:

One ton of waste at producer	$ 50
Labor handling same per ton	30
Expenses of plant per ton	1.00
100,000 cubic feet	$1.80

or less than two cents per thousand cubic feet.

Incredible as may seem these figures, yet they are certainly approximately true, and will, undoubtedly, in time, be fully verified. The perfection of appliances is going on at a most rapid pace.

The presence of the large proportions of hydrogen and carbonic oxide in this gas constitutes the intensest known heating element, and defies natural gas with its marsh gas and its heavy hydro-carbons, which have more illuminating, but less heating power. Prof. S. A. Ford, chemist of the Edgar Thompson Steel Works, making comparison between the effectiveness of Pittsburgh soft coal and the average quality of natural gas, reaches a conclusion that 1,000 cubic feet of gas equals 62.97 pounds. The equivalent of 1,000 feet of gas of a higher quality is 20 pounds of anthracite. There is no immediate fuel possibility equal to anthracite gas.

From the foregoing figures as the cost of production the conclusion is reached that this artificial gas may economically take the place of natural gas, and that it is to be the fuel of the future.

Making the Schools Practical.

(From the New York World.)

Wendell Phillips once condemned the public schools of Boston for "not teaching the pupils anything that the world will give them a living for knowing." The criticism still holds good of most of the public schools in the country. They not only teach the children nothing that the world will give them a living for knowing or doing, but they do not, save in a few cases, teach them anything which will help them to get, without further fundamental instruction, the self-supporting knowledge or skill.

All the friends of a more practical primary training for the young will commend the action of the Committee on Technical Education in asking of the Board of Estimate an appropriation of $50,000 with which to begin the work of introducing industrial training in the public schools of this city. It is proposed to secure steam power for a single room in some of the school buildings and establish a voluntary "elective" course in the use of ordinary tools and machinery. The training of the hand, the eye, the judgment and the muscle of the pupils can thus be carried on in connection with the training of the mind. It has been found, in practical experiment, that the boys study better with the pleasant variation of congenial handwork.

Let New York lead off in the direction of making public-school instruction more practical and better suited to the needs of the great mass of scholars.

The steam heating plant at Troy, N. Y., has been turned into a plant for making water gas, which is distributed through the pipes laid for the steam distribution.

Pernicious Engravings.

A correspondent writes us: "There should be a law forbidding the publication of dangerous wood-cuts. A recent publication gave an illustration of a darkey going by a frog pond and about to jab an inviting frog with the handle of a scythe carried over the dusky shoulder. The scythe was jerked downward with vim, and the poor darkey was decapitated. I was telling the incident in the shop, and to illustrate it took an adze which one of the fellows happened to have at hand. In my act of stabbing the frog the adze blade dropped down the handle and I got a cut in the back of my head."

From time to time demands are heard for a Government control over steam boilers, more especially when some disastrous explosion occurs, drawing public attention to the subject. In the twenty years following 1864 there was in Great Britain an average of 46.7 boiler explosions per year, with averages, 53.14 persons killed and 142.14 injured. In Germany, on the other hand, where the law on the subject is exceedingly stringent, the figures before us show that from 1877 to 1884 inclusive, there were only 126 boiler explosions, or an annual average of 15.75. The numbers killed and injured averaged respectively 17.4 and 49.—*Industries.*

After to-day we expect to pay a little more attention to the editorial department of the daily. A man can't repair boilers, build presses, nurse a sick baby, pull teeth, doctor burns and bruises, and edit a daily paper all at the same time, and we are only a man.—*Independence (Mo.) Sentinel.*

Several correspondents write us citing chimneys higher than the chimney in Germany referred to in our issue of Nov. 6. They are quite right.

Practical Drawing.

BY J. G. A. MEYER.

SIXTH PAPER.

80. To draw lines perpendicular to the horizontal lines we use the set squares, see Figs. 48 and 49. These are made in the form of a triangle, and by some draftsmen they are called "triangles." They are sometimes framed together as shown in Fig. 48, and sometimes made solid as shown in Fig. 49. Those that are framed together are generally called open set squares, and the others solid set squares. The open ones are by far the best. It is always advisable for the student to provide himself with two different forms of set squares. One of these set squares being made with the perpendicular sides of equal length, the three sides forming two angles of 45 degrees, and one angle of 90 degrees. (See Fig. 49). For ordinary use, the length of the perpendicular sides should be about eight inches long and the set square about $\frac{3}{32}$ of an inch thick. The other form of set square has also two of its sides perpendicular to each other, but not of equal length. The length of three sides should be so proportioned that the triangle will contain one angle of 90 degrees, one of 60 degrees, and one of 30 degrees (Fig. 48). To obtain these three angles, make the shortest side, *a b*, exactly one-half the length of the longest side, *b c*. A convenient length of the shortest side, *a b*, is $6\frac{1}{2}$ inches; this will necessitate the longest side, *b c*, to be 13 inches long. $\frac{3}{32}$ of an inch will be the proper thickness of the set square. As for material, plain straight-grained maple will give very good satisfaction.

81. For drawing lines perpendicular to the horizontal lines, we may use either set square. Place the T square in any desirable position, exactly in the same manner as described for drawing horizontal lines (art 79). Then place the set square with one of its sides about the right angle as *a b*, Fig. 50, against the upper edge of the blade of the T square and along the other side *a c* of the set square draw the perpendicular line. The set square—and in fact any any square or ruler—should always be placed in such a manner that it will lie underneath the right hand when a line is to be drawn.

By moving the set square along the edge of the blade of the T square, while the latter is held in one position, any number of parallel lines, perpendicular to the horizontal lines, can be drawn. (See Fig. 50.) If these are not parallel, then the drawing board, or the T square, or the set square is not perfectly constructed; or it may be that all three are out of order; but whichever it may be, it must be at once corrected.

These set squares are also used for constructing figures of particular forms which we will very soon explain. When perpendicular lines are to be drawn, which are considerable longer than the set square, we are compelled to use the T square in place of the set square, but this should be avoided as much as possible. However, when we are compelled to use the T square for this purpose, place the head of the T square against the bottom edge of the drawing board, and then draw along the left hand edge of the blade.

82. Drawing pen, Figs. 51 and 52. This pen is used for drawing straight ink lines, and is, therefore, frequently called (and very properly too) "straight line pen." This instrument consists of two thin blades *a a* attached to a straight handle. One of the blades works on a hinge *b*, so that the blades can be spread apart for cleaning. The blades are connected by a screw *c*; with this the distance between the blades is regulated, and thus enable us to draw either fine lines or broad lines, as the case may require. Of course for fine lines the blades are brought pretty close together, for broad lines they are allowed to stand further apart. The handle is generally made of ivory, the connection between the handle and blades of German silver, and the blades of good steel, thicker above the screw *c* than below it, to insure firmness when the pen is in use. The blades must be curved, as shown in Fig. 51, so that when the points are touching each other a space will be left above them to hold the ink.

The blades should be properly tempered, enabling them to spring apart when the pressure brought upon them by the screw *c* is released. The ends of the blades below the screw should have such a temper that they will not break by usage, yet sufficiently hard to keep the ends sharp for a considerable length of time. The proper shape of the bottom ends of the blades is shown in our illustration. For instance, looking at the pen as indicated in Fig. 52 the ends should have a half round edge as represented, but looking at the pen as indicated by Fig. 51 we see the blades edgeways, and the bottom of the blades should have sharp edges as shown. When the edges become blunt through usage they should be restored to their original sharpness by grinding them on a fine oil stone, but in no case should the oil stone be applied to the inside of the blade, always on the outside. Great care should be taken in sharpening a drawing pen, because if one blade is allowed to project beyond the other the pen will not work; if the ends are dull a fine line cannot be drawn; if a burr is left on the end of either blade a broken line will be the result; if any dust is left between the points bad lines are sure to follow. For putting the ink between the blades a small brush or small piece of paper is used; by dipping either of these in the ink and then passing it between the blades, the ink will remain in the pen. Not a particle of ink must be allowed to remain on the outside of the blades, as any ink left on the outside of the blades will create blots. Always clean the blades before taking a fresh supply of ink.

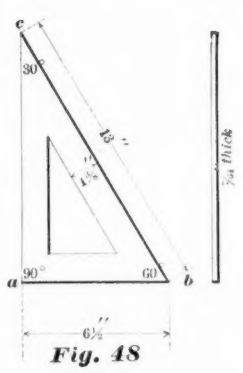


Fig. 48

Fig. 49

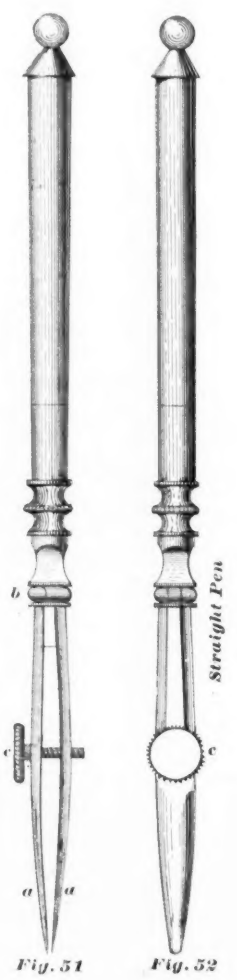
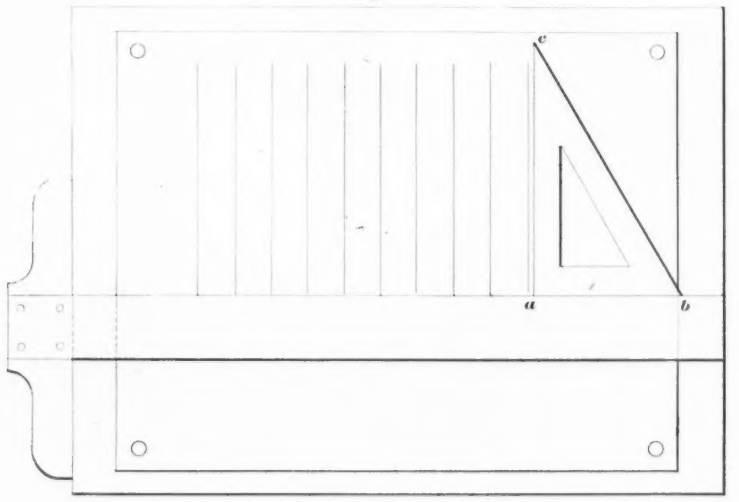


Fig. 51

Fig. 52

Fig. 50



83. The correct manner of holding the pen, when in the act of drawing a line, is to hold it perpendicular to the surface of the paper, the flat side of the blade against the edge of the square, the two blades being between the head of the screw *c* and the square, and the inside surfaces of the blades parallel to the direction of the line to be drawn. Always move the pen forward, that is, from left to right hand, never backward. Do not press too hard against the square, as this will change the breadth of the line. Before putting the pen away always clean the blades; never allow them to rust. Although this instrument is very simple and easy to handle, yet it requires considerable practice to handle it successfully. Various sizes of these pens can be bought, but one such as illustrated is about the proper size.

Preparing for Master Mechanics' Reports.

Secretary Setchell, of the American Railway Master Mechanics' Association, has sent out two circulars to members. They are as follows:

The undersigned, a committee appointed by the Master Mechanics' Association to investigate the various types of traction increasers, and to report upon their relative merits, and the conditions under which their use can be recommended, respectfully ask that you will reply to the following questions:

1. Have you had any experience with devices for increasing the tractive power of locomotives?

2. Under what conditions would you advise the use of such a device?

3. What do you consider the best-known arrangement for this purpose, and what is the cost of its application and maintenance?

4. Is there any good objection to utilizing the weight of the tank for this purpose?

Please address R. H. Briggs, Chairman, Argentine, Kansas.

The undersigned having been appointed a committee for the purpose of obtaining information relative to the practice of Master Mechanics in regard to the use of piston rod, valve stem and steam cylinder packing upon locomotives, respectfully solicit replies to the subjoined inquiries.

There is no part of the mechanism of the locomotive where so much loss in money value actually occurs as that incurred by the constant blowing away of steam, which must take place where imperfect or defective packing rings are employed, which not only escapes inert into the exhaust, but during part of the movement of the piston actually exercises a retarding influence upon the engine. It is therefore our plain duty to make the subject of packing rings an important and constant study, and to be willing to impart any special information to others for the general good.

In order to make a full report embodying the views of the membership, we request you to make replies to the following as early as may be possible.

1. Do you use cast-iron for packing rings?

2. What width of ring is your general practice?

3. What thickness of ring when first applied?

4. How much larger than the cylinder are the rings when first applied?

5. Do you, after turning the rings up, cut them, spring them in, clamp them and turn them to the correct diameter of the cylinder?

6. Do you make the ring heavier opposite to where it is cut open?

7. What is your usual plan for breaking joints?

8. Do you use springs to assist in getting the packing ring out, or depend upon the elasticity of the ring assisted by steam?

9. Do you use more than two rings in any of your engines?

10. Have you tried steel, phosphor-bronze, or gun-metal, and if so, please state results as far as thus tried?

11. Do you use Dunbar or any patented style of cast-iron packing rings? If so, please give name and address of patentee.

12. Do you use solid piston-heads and spring the rings into the grooves or followers and hub, T, or bull rings? Or, if both, state which you think preferable.

13. What is your general practice for adjusting the piston in the center of the cylinder—do you turn the T ring out larger than the spider and line up with sheet-iron, or set screws, or clamp the T ring with the follower to hold the piston in center of cylinder?

14. Do you drill small holes in the piston and follower to set out the packing?

15. How much side shake do you allow when rings are new, or do you make them close fit between the T ring and follower or piston?

16. What is your observation of the wear on cylinders incident to the use of steam packing as compared with the old style of brass spring packing? Do you notice that the cylinders are worn away more rapidly near the ends, and do you regard this irregularity in the diameter to be any disadvantage in a packing which is flexible and automatic in its adjustment? How often do you think reboring necessary?

17. Do you permit the practice of pening the ring when worn to enlarge them, or have you some special plan for enlarging them?

18. Do you use any special grade of cast-iron for packing rings? If so, state character of metal.

1. Do you use hemp exclusively and in preference to other packing?

2. Do you use any of the prepared fibrous packings, and if so, what kinds, and how do they compare?

3. Can you give an approximation to the cost of packing per 1,000 miles for pistons and valve stems with hemp, or with any fibrous packing you may use?

4. Do you use any form of metallic packing for rods and stems? If so, please state kind and maker's name, or if your own design, please furnish a tracing or print of the device, giving particulars of cost of manufacture, and length of time or number of miles between renewals; also composition of metal.

5. Do you find it more difficult to keep metallic packing tight on valve stems than you do on piston rods? If so, please give your opinion of the cause.

6. Any special information not enumerated above willbe gladly accepted by the committee.

HENRY SCHLACKS,
ALLEN COOKE,
J. W. STOKES.

Address all replies to J. W. Stokes, Pana, Illinois.

Hand Drills.

The hand drills shown in accompanying illustration are not new, but have been introduced only to a very limited extent. They were originally built by other parties, but have passed into the hands of Thos. H. Dallett & Co., of Philadelphia, who are now manufacturing them and placing them before the mechanical public. The No. 1 hand drill is made entirely of steel One setting will drill anywhere over a surface of thirteen inches outside diameter and four inches inside diameter.

By using the bottom clamp and stud it can be fastened to a bench or the flange of a casting, and, with clamp and stud removed, it can be bolted or clamped to any flat surface.

The greatest distance from end of spindle to base is nine inches, and the vertical adjustment of post four inches. It will drill up to $\frac{1}{2}''$ diameter. The drill weighs eleven pounds.

The No. 2 hand drill is also made of cast steel.

The crank is adjustable in length to suit size of hole being drilled, and can be used either at end of arm or at end of spindle.

It is very convenient to set and adjust, and at one setting it will drill anywhere over a surface of 19 inches outside diameter, and 8 inches inside diameter.

By using the bottom clamp and stud, it can be fastened to a bench or a flange of a casting; and with clamp and stud removed it can be bolted or clamped to any flat surface.

The vertical adjustment of post is five inches, and the machine will drill up to $\frac{7}{8}''$ diameter. The drill weighs 33 pounds.

Railroad Shop Notes.

In the New York elevated railroad shops business is conducted in its usual systematical and economical manner. Every effort is made to keep the locomotives in a high standard of excellency. Whenever experience indicates that certain changes in the mechanism of the engine will add to its efficiency, these changes are made in times warranted by economy and the traffic of the road. We notice that at the present time some of the four-wheeled connected engines with two-wheeled trucks, and which needed and are now undergoing thorough and general repairs, are in the meantime changed into four-wheeled connected engines, with four wheeled truck—the regular "Forney" type of engine. The remainder of the class of engines with two-wheeled trucks are also to be changed in times when these will absolutely require thorough and general repairs; but so long as these engines can be made to run comparatively satisfactorily, with only slight repairs, no changes are to be made.

We also notice that the cast-iron driving boxes, which are worn out, are replaced by solid boxes cast of brass. This we believe to be a good move in the right direction, as with brass driving boxes for locomotives so small as the elevated railroad engines, the expenses of repairs will be reduced, and axles of larger diameter, which experience indicates to be necessary, can be adopted, without changing other parts of the engine. Worn-out wooden cabs are replaced by iron cabs of a very neat design. Great care is bestowed upon the boilers; these are inspected, examined and cleaned regularly every month, and kept in first-class order. In the boiler shop we noticed under construction a boiler with a Bellpaire fire-box, which is soon to be placed in one of the locomotives running on the elevated railroad.

The shops are equipped with the best of modern tools, and the amount of work turned out every month, under the present good management, is surprisingly great.

In the *National Car and Locomotive Builder* for November, Angus Sinclair has notes of his visits to several railroad shops. We copy below notes about two of the shops:

WABASH SHOPS AT SPRINGFIELD.

During a recent visit to these shops I found they were very busy, mostly with repair work. They have got seven engines in the machine shop, most of them getting heavy repairs, especially in boiler work. The dry summer has been particularly hard on Western roads that have to use lime-impregnated water, for the surface water has been scarce, and consequently a greater proportion of well water had to be used. The Wabash is by no means the only road that has been forced to do heavy boiler work this season.

Some engines in the shop are getting new boilers, new cylinders and new driving-wheels. The company have a good many small engines, with cylinders under 17 inches, that have wheels $5\frac{1}{2}$ feet diameter and over. Such engines are almost useless with the heavy trains of to-day, and Mr. Barnes is putting smaller wheels under the engines, so that they may be put to service that will wear them out.

The shops are old, have grown large by degrees, and consequently are inconvenient for handling work cheaply. They have some good tools, but many of them are antiquated. They built seven new engines last year and are getting out material for five more. At present 275 men are employed in the shops.

They are putting the Barnes extension front and smoke-preventing device on all engines that pass through the shop. Engines thus equipped are making remarkable records for economy of fuel. One engine, No. 1,200, that pulls the Quincy passenger train, consisting of five cars, has month after month made between 70 and 80 miles to the ton of coal. The engine has cylinders 17 × 24 inches and the boiler has 1,220 square feet of heating surface, 118 square feet being in the fire box. This gives 2.68 square feet of heating surface to the square inch of piston area, a proportion which ought to answer very well for Illinois coal.

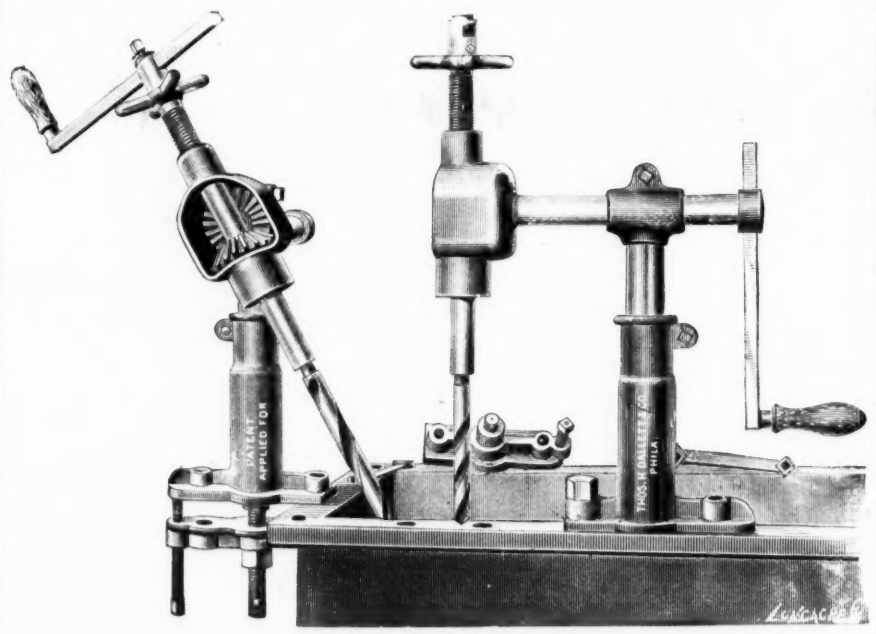
C. B. & N. LOCOMOTIVE SHOPS AT AURORA, ILL.

The machine shops here are old and inconvenient, but the ingenuity of the men in charge has done a great deal to overcome natural disadvantages and supply the means of getting work done economically. The work on hand is entirely in the way of repairs, but some of it is quite heavy. They are doing considerable work for the Chicago, Burlington & Northern road. Connected with the shop there is a very good tool room, which has a full equipment of standard small tools kept in good order and held to the proper size by the most approved test gauges. They have also templets with hardened bushes for the principal parts of their standard engines. Besides good small tools and accurate templets, they have numerous jigs and special attachments to machine tools for saving labor or for promoting accuracy of machine finish. They make excellent use of horizontal emery wheels running on arbors that pass through and rest above a cast-iron table. Among the work finished here, is the inside face of expansion links, a movable jig keeping the work to the proper radius. I have often seen the outside portions of links finished on emery wheels, but this was the first instance I had seen of the inside being finished in the same way.

With a special tool held on the arbor of a Brown & Sharpe milling machine, they turn globular surfaces, such as the outside of injector check valves. The tool can be adjusted to turn any size of globe that the table will hold.

They put an attachment on a radial drill for milling out the steam chest ports, and for doing other work of a similar nature. A heavy jig is used for holding the driving boxes on the table of the boring mill, the device being so arranged that the box can be adjusted in an instant. But the most important special tool is a sort of radial tool-holder for planing the inside of the driving boxes. Instead of slotting these boxes, 32 of them are stretched together on a long planer, and this tool does the work better than any slotter, and in half the time. The feed can be adjusted from $\frac{1}{32}$ to $\frac{1}{4}$ inch.

Hand Drill, No. 1.



Hand Drill, No. 2.

The mechanical department have adopted solid ended channel-section side rods for all new work, and the officers speak highly of the service given by this form. The rods are forged to size, and then the ends are planed. The pin holes are then laid out by a heavy templet, which is made the exact size of the rod. A small hole is then drilled in the centers, which is used to guide the tool which bores the hole to size. For this purpose a plain cutter, held in a steel bar, is used, the same kind of tool that is used in many shops for drilling the holes in flue sheets. The bushes are pushed into the rods with a small vertical hydraulic press, which is operated by a pump driven by a crank connected with the shop shafting. A similar press, but a little heavier, is used in the boiler shop for straightening sheets and other purposes.

They are using the Ross brake shoe for drivers on several locomotives belonging to this road. The shoe in question is so formed that the rubbing part is impressed upon the wheel flange and upon the portion of the tire outside the usual tread. The tendency is to wear down the parts that have to be turned down when wheels are sent to the shop. One set of these shoes that has been in use on this road for about a year is said to have reduced the necessity for turning tires about 50 per cent. The company have lately made a change in the pattern of the shoe to make the pressure more central.

They are putting a new overhead iron carrying crane into the boiler shop; also a pneumatic riveting machine of the Allen type. Air for operating the machine will be compressed by an Allen air compressor. The boiler shop is small, but the tools are so good and so compactly arranged that a great deal of work can be turned out.

Among other attractions that I saw during an hour's walk round the shop was a device for attaching air brake hose to the connections. With this appliance 40 hose can be put on to the attachment and clamped firmly in place by one man in one hour. They are using a whistle with a valve set horizontally in such a way that it can be removed for grinding without disturbing the whistle. The Jerome packing is used exclusively for piston rods and gives entire satisfaction. They are putting in a battery of six new boilers built at the shops for supplying the locomotive portion of the shops with steam.

Return Tubular Boilers.

By William Lowe.

PROPORTIONS OF RETURN TUBULAR BOILERS, COMMONLY KNOWN AS HORIZONTAL TUBULAR BOILERS, AND THE REQUISITES NECESSARY FOR EVAPORATING FROM $1\frac{1}{2}$ TO $2\frac{1}{2}$ POUNDS OF WATER PER FOOT OF TOTAL HEATING SURFACE PER HOUR, AND DELIVERING THE STEAM AS DRY AS POSSIBLE, AND WITH THE MAXIMUM ECONOMY OF FUEL.

At the outset I will say that to those conversant with this subject it would perhaps seem that it was exhausted on account of the long and continuous ventilation of it, but it is a remarkable fact that no subject has, nor perhaps ever will be so completely exhausted that there is no more to be found in it, or to be said on it, by deeper investigation of it. In fact, not one, nor many minds, can get to the bottom of a subject or inquiry, because the more they are used and handled the more depth and matter is found, and each person finds, according to his knowledge, practice and ability. In this connection I will say that, in my experience, the most remarkable cases of superficial observation are those wherein self-interest is the controlling effort, and it is not to be expected that even those who have a practical knowledge of a subject, when coupled with a pecuniary interest in displaying it, will contradict their practice and opinion entirely. Therefore, amongst all the statements of practice, opinion, and even tests, those interested must determine for themselves which is the most likely to be correct.

Preliminary to the main subject, I desire to call the attention of those interested to the great difference in the proportions of these boilers and their rating, as shown by the price-lists of the many makers of them.

To illustrate, I will take a 50 horse-power from the lists of two of the largest makers, one in the Eastern, the other in the Middle States. The 50-horse-power of one is 50 inches diameter, 16 feet long, containing 48 3-inch by 15-feet tubes, and dome, 30 inches diameter, 30 inches high. The 50 horse-power of the other is 54 inches diameter, 13 feet long, with 70 3-inch tubes 12 feet long; dome, 34 inches diameter, 30 inches high.

The 100 horse-power of the first maker referred to is 66 inches diameter, 19 feet 4 inches long, containing 82 3-inch tubes 18 feet long; dome, 30 inches diameter, 30 inches high. The 100 horse-power of the other maker is 66 inches diameter, 15 feet 4 inches long, with 128 3-inch tubes 14 feet long; dome, 40 inches diameter, 40 inches high, and the number of 3-inch tubes put into the several other diameters of these boilers, by these two makers, is as follows: 42 inches diameter, the first one

puts in 36, the other 40; 48 inches diameter, 48 and 56; 54 inches diameter, 58 and 70; 60 inches diameter, 70 and 84; 66 inches diameter, 82 and 128. The question naturally comes in here, which is the nearest right, and which of these proportions, each having the same amounts of heating surface and pro rata grate and chimney, will evaporate from $1\frac{1}{2}$ to $2\frac{1}{2}$ pounds of water per foot of total heating surface per hour, into dry steam, with the least fuel? I venture the assertion that most of these proportions will not get the greatest effect from the fuel, nor give the dryest steam.

Beginning now with the main subject, and in considering the proportions of this type of boiler, I will take up in the order mentioned the following:

Length of tubes in relation to their diameter.

Number of tubes for each diameter and their relation to the water and steam room of the boiler.

Layout of tubes and their distribution and height in the boiler. Domes, value of, and proper proportions. Domeless boilers. The application of different sizes of tubes to the same size or diameter of boilers, and the comparative effect in vent and heating surface.

All these points have been written on many times, and rules and instructions given in works of eminent authors; but there seems to be a lack of unanimity and uniform proportion amongst them, and the rules may be right for some sizes, but give doubtful and unreasonable proportions for others. For instance, one authority of considerable importance and ability in this country considers 48 3 inch tubes in a 48 inch diameter boiler right, and only 66 in a 60-inch, and vary in other parts and ways, so that the inquirer and investigator are left in doubt which to follow. Therefore, the writer made a proportion for these boilers for his own use, in his manufacture of them, and has followed it, so far as competition and the influence he has been able to use will permit, and having proven by comparison in his practice that they are the best, feels justified in publishing them for the benefit of all concerned.

LENGTH OF TUBES IN RELATION TO THEIR DIAMETER.

The length of the tubes from 2 inches to 4 inches diameter should not exceed 5 feet of length, to 1 inch diameter; so that 2-inch tubes would be not over 10 feet long; $2\frac{1}{2}$ inch $12\frac{1}{2}$ feet; 3 inch 15 feet; $3\frac{1}{2}$ inch $17\frac{1}{2}$ feet; and 4 inch 20 feet, and intermediate sizes in same proportion. Any increase in these lengths will require an increase in the power of the chimney to increase the velocity of the gases, to cover the additional heating surface in the increased length of tubes as effectively as possible, and the gain in power of the boiler, under the same rate of evaporation per total heating surface, as with the shorter tube, will cost more in fuel, because the power of the chimney to overcome the friction of the gases and increase their velocity to retain the same temperature at the end of the long tube with the same size, and consequently the same vent, will take more fuel from the furnace *pro rata* to the work done than the shorter tube.

NUMBER OF TUBES FOR EACH DIAMETER OF BOILER, AND THEIR RELATION TO THE WATER AND STEAM ROOM OF THE BOILERS.

The number and size of tubes should have a *pro rata* proportion to the area of the diameter of the boilers, and in my practice I have found the following numbers of tubes to be the best: 48 3-inch tubes is the best number for 48-inch boiler. These 48 3-inch tubes have a displacement of 5.35 of the area of the boiler shell, and if this proportion is applied to other diameters, it will be found that a 30-inch boiler should have 18 3-inch tubes, 36-inch 27 tubes, 42-inch 36, 48-inch 48, 54-inch 61, 60-inch 75, 66-inch 91, and 72-inch 108; and if any other size tubes are to be used, the number for each size boiler should be determined in like manner.

LAYOUT OF TUBES AND THEIR PROPER DISTRIBUTION AND HEIGHT IN THE SEVERAL DIAMETERS OF BOILERS.

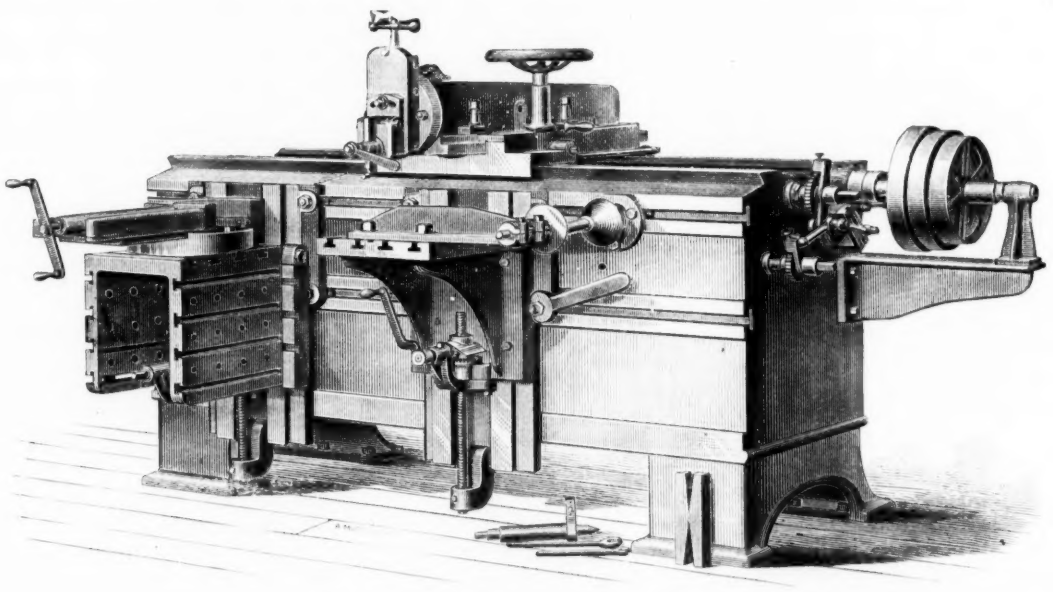
This is of great importance to the successful working of the boiler. The writer's experience on this head is that, previous to 1855, the tubes in these boilers were placed low down in the boiler, and in staggering rows, which left no vertical passage between the tubes, for the passage of the steam to the surface of the water, or in other words, the circulation was obstructed by this layout of tubes, and moreover nothing could be put down to the bottom of the boiler between the tubes, to clean it or the tubes. About this time the writer made these boilers, with tubes set in vertical rows (and never made them in any other way) with a liberal space between the rows, and a little larger space in the center of the boiler, between the adjacent rows, and carried the tubes well up from the bottom of the boiler, and higher at the top, than was then customary, and found by comparison that the boilers steamed better, and gave better results and satisfaction than the other layout, and has continued this practice up to the present time, and others were led to the same practice, by the better results obtained, and greater convenience of access to tubes and bottom for cleaning, and now it is the universal custom. For proper accessibility for cleaning and repairs, as well as for good circulation, the tubes should not be nearer the shell of the boiler than $\frac{1}{10}$ of the diameter in boilers; from 30 inches to 42 inches diameter inclusive, and $\frac{1}{12}$ from 48 inches to 72 inches diameter boilers inclusive, and other sizes in proportion, and there should be a clear space of from 5 inches to 10 inches, from the bottom of the boiler to the bottom of lower row of tubes, from 30 inches to 72 inches diameter of boilers, pro rata to their diameter, and large hand holes in both heads. The writer remembers several cases in his experience wherein the tubes were so close to the shell of the boiler, that some of them had to be taken out, before riveted patches could be put upon the boilers.

The distance from the top of the top row of tubes to the top of the boiler should be a pro rata proportion to the diameter of the boiler, and I have found that for boilers having domes, or a dry pipe, that three-eighths of the diameter of the boiler is the best, which would be $11\frac{1}{4}$ inches in 30-inch boiler, $13\frac{1}{2}$ inches in 36 inch, $15\frac{3}{4}$ inches in 42 inch, 18 inches in 48 inch, $20\frac{1}{4}$ inches in 54 inch, $22\frac{1}{2}$ inches in 60 inch, $24\frac{3}{4}$ inches in 66 inch, and 27 inches in 72 inch boiler, and in same proportion for any other size.

Twenty by Sixty Inch Traverse Shaper.

This shaper is designed for all classes of light and heavy machine work. It has a stroke of 20 inches and a traverse of head of 60 inches. The length of stroke can be changed while the machine is in motion, thereby making a direct saving in time over a crank machine. The machine has automatic feed in all directions; also has circular feed, and a circular arbor can be used with the cones for hollow work or centers, same as planer centers may be used to carry a common lathe arbor. The centers are shown on the floor in front of the machine in the cut. The bed of machine is made very deep, giving support to the tables low down, thus making the tables steady under the most severe cuts.

One of the tables has a patent adjustment for planing work on a taper. The table can be removed and work fastened on the saddle or tables, and saddles can be run off the bed and work fastened directly to front of bed or on the floor. A hand wheel on top of saddle gives ready means of setting the cutting tool to the work without the operator going to the end of the machine to turn the screw. Altogether it is as handy as a large tool can be made. The weight is 6,700 pounds. This machine is built by the Hendey Machine Company, Torrington, Conn.



TWENTY BY SIXTY INCH TRAVERSE SHAPER.

LETTERS FROM PRACTICAL MEN.

Moulding Pulleys.

Editor American Machinist:

The best system of making pulleys that I have seen, is in operation at the Walker manufactory in this city (Cleveland). They make all their small pulleys, that is, up to 40 inches, on a machine in flasks, and they work it so well that a man of limited experience can put up 8 or 10 of them in a day, with an 18 or 20 inch face. For their larger pulleys, that is, up from 40 inches to 9 feet, they have rings 21 inch face, and that is where the principal benefit comes in.

In the average run of shops the rings vary from 4 to 7 inch face, so that when a moulder has to make one 20 inch face it takes about double the time to make it that it would if the pattern was 21 inches. They have 2 rings for the same size pulleys; one is thicker than the other, for the reason that when they make a double arm pulley it needs more strength than an ordinary one, and likewise one is for single belt and one for double belt.

The rings are made with a flange on top on the outside $\frac{1}{2}$ inch thick, for the purpose of lifting, and a very good way they have of doing it with 3 hooks attached in a ring with a screw and swivel. When a straight lift is wanted put your hooks equal distance apart and hoist till you see the pattern move; if one side moves before the other, screw up a little, or till you can see it move, and then hoist away.

They have holes in their patterns the same as Mr. Masters described in his account of pulley making, but they don't use them. When a man is given an order for a pulley he takes it to the pattern maker, who makes a guage that reaches from the top of the pattern to the top of the arms, so that when the mould is rammed up near to the place where the arms are to go, put a streak of sand up to the pattern and strike it off all around, then put in the arms and work them down to their place.

They have a series of plates that fit in between the arms with bolts threaded at both ends screwed in. After it is rammed up they have plates 3 or 4 inches thick, with holes in them for the bolts and one in the center for the runner; put washers and nut on and screw it as tight as you can and it will lift altogether. The thickness of plates, or rather the weight, does away with the extra trouble of weighting down, as that is quite sufficient and they never cover a large pulley with cores or anything else, as they cut off about half an inch, or as much as the moulder puts on, more than what they need.

There are a great many moulders that are afraid to put the iron too fast in a pulley, for fear it will run over; but I say shove it in as fast as you can, if you want to get a clean, good casting.

THOMAS WATHEY.

Wear of a Crank Pin.

Editor American Machinist:

In No. 46 W. H. Carr says that "when a crank-pin wears on only one-half its surface, it indicates that the engine is very much out of line."

If he will look a crank-pin square in the face he will see that it can wear only on one side from work, and all the wear on the other side will be the friction when the boxes are snug. One side of the pin takes all the wear on one stroke, it is then turned around and the same side takes the wear on the other stroke.

W. E. CRANE.

Waterbury, Ct.

Mixing Soda Water.

Editor American Machinist:

I find in the columns of the AMERICAN MACHINIST, "Questions and Answers," Apprentice asks for a recipe for making soda water.

I desire to give a rule for making soda-water which will give good results, as it is in daily use: To eight quarts of water add one quart of good lard oil; then add a small quantity of B. T. Babbitt's pure potash, or lye, stirring the mixture well until it has the appearance of milk, and it is found that the work does not rust after using. Should the work rust add a slight amount of oil. Too much potash will destroy the value of the oil. If it is found that after the mixture has stood a while the oil is on top, add a small quantity of potash. The object of oil is to give the mixture a heavy body, and prevent the work from rusting.

In a great many shops large tanks are filled and the mixture forced on to the work by a small pump. When the mixture contains too much oil the pump mixes it well together. Still it is objectionable to have too much oil, as it is left on the work; whereas, if the mixture is made as above stated, the work will be left clean.

C. E. SIMONDS.

Somerville, Mass.

Information Wanted.

Editor American Machinist:

Steam engine economy is a question that probably interests as many of your readers as any one subject that appears in your columns. I come to your readers with a couple of cases that I should like to hear about from those who know.

I have lately had considerable to do with two engines, both underloaded and of course extravagant in the use of coal. One $16'' \times 20''$, 140 revolutions cutting off at $\frac{3}{8}$ stroke attains full speed with full load at 20 lbs. steam pressure. The other $12'' \times 24''$, 45 revolutions cutting off at $\frac{3}{4}$ stroke, will do its work easily with 45 lbs. steam. I would like to know about what saving there would be in substituting automatic engines and about what power is being used now.

FIREMAN.

An Expanding Mandrel—Turning Tapers.

Editor American Machinist:

Some of us have, no doubt, wished many times when trying to turn or do other work on a large thin ring, that we had a good expanding mandrel; not one of those sqmetimes seen having only 3 points of contact, but something having all the good points of a solid mandrel, with the additional one of expansibility. Necessity compelled us to have such a tool, which we made some time since and have used it considerably; it answered its purpose quite well, but I would not try to have you think it was perfectly true by any means. It is, however, nearer true than many solid mandrels in use.

The sketch, Fig. 1, will give an idea of its longitudinal section. It is made almost wholly of cast iron, the body having hardened steel centers driven in below the surface of the ends of casting, the projecting ends of body being of suitable size for a dog. The body and sleeve are boxed and turned to a taper of $1\frac{1}{2}''$ to the foot, nearly, this being a taper we could get easily on our lathe by gearing the screw for feed, and at the same time using the geared cross-feed, thus turning and boring the taper without moving the centers out of line. The body and also the shell of mandrel, after a careful fitting, are grooved parallel with the line of centers in three places equi-distant with a square groove, in which are placed square bolts having T heads, the bolts serving to draw the cones together, and acting as feathers as well, to prevent the cones slipping around on each other, the outside sleeve being split through into one of the bolt grooves to allow of expansion. This it will be seen is not new in principle, it being just the opposite of one-half of a Sellers coupling as made for shafting.

When obliged to turn tapers by throwing lathe centers out of line I have had the best success by turning centers as in Fig. 2, making the end something like an acorn having its diameter small enough so it can never touch the corner formed by end of piece with center hole, at whatever amount the dead center may be set over. Harden both centers of lathe as well as the work, and true up lathe centers with a diamond.

CHAS. S. BEACH.

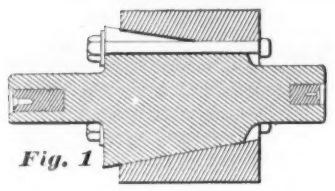


Fig. 1

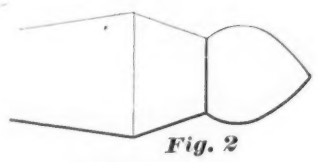


Fig. 2

TURNING TAPERS.

Adapting Work to Suit Customers.

Editor American Machinist:

I notice an article in the AMERICAN MACHINIST of Nov. 6, with the above heading, that I think is very applicable to the tool builders of the present day. Their refusal to do it is often the means of compelling shops that are not engaged in tool building to make their own tools, as they generally know their own wants the best, and make their tools to fill that want.

How few shops have a continuous use for a large pipe threading machine, or for a large bolt cutter that will cut, say, up to a $2\frac{1}{2}$ inches diameter bolt. The writer has tried to get tool builders that make such machines to make a machine that will cut both pipe and bolts. They say they don't like to do it, as they would have to change their patterns, and that you will have to get a machine for each class of work. This being the case, we are compelled to go to work and make the machine ourselves, and by so doing some tool builder is cheated out of a job.

Needing a very powerful drill-press—one capable of cutting large flue holes in steel boiler-heads, say about 16 to 18 in. diameter—the spindle of the press required special appliances. These we had to make, as builders of tools would not deviate from their established patterns.

One of our specialties is architectural iron work. In facing up the ends of iron columns, we had to resort to the common lathe, put a false center in the end of column, catch the other end in the chuck, face up one end; then take it out, turn it around, end for end, and repeat the operation. Now, where the column is heavy and you are pinched for room, especially if the lathe stands against the wall, this is no fool of a job. To simplify this work, and make it much easier and face up both ends at once, required a special tool. This we had to invent and make, as no one made that class of tool for that purpose. But the tool has paid for itself many times over.

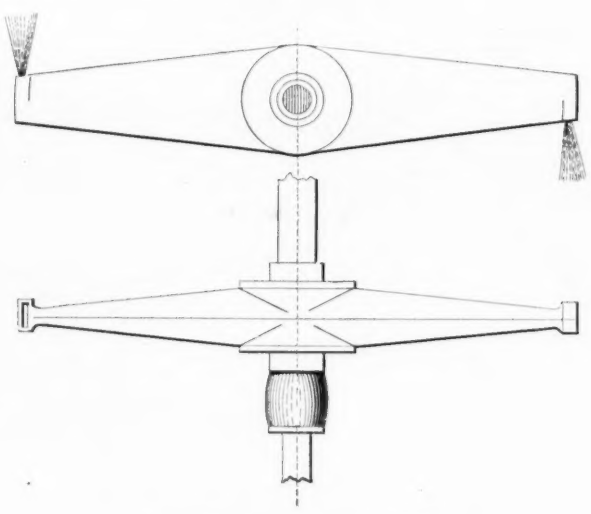
BENJ. F. HETHERINGTON.

Indianapolis, Ind.

High Speed Rotary Engine.

Editor American Machinist:

In your issue of November 6th Mr. Sweet's allusion to the "Avery rotary" brings vividly to mind some early impressions and experiences in the mechanical line. The extreme simplicity and remarkable performance of the "Avery" created quite a stir among the steam motor fraternity. Some, in their enthusiasm, predicted that it would soon supersede all other steam motors. I first saw a notice of the engine in a New York magazine in the autumn of 1835. There were several of them then at work in the various industries of sawing mahogany, turning, printing, etc., rated at 2, 6 and 15 horse-power, with 12, 18 and 30 inch arms, respectively. The motive part of the engine consisted simply of two opposite hollow arms fixed at right angles to a hollow shaft; steam from the boiler entering the shaft and passing out at the ends of arms in opposite directions as shown in the sketch. The exit passages are only from $\frac{1}{16}$ to $\frac{1}{8}$ of a superficial inch. The principle of its action was precisely the same as that of a rocket in its flight.



AVERY ROTARY ENGINE OF 1835.

This is all there was of it except that the arms were inclosed in a metallic case which gave the engine the appearance of a huge watch standing on its stem, the spent steam passing out through the stem. The ends of the shaft projected out of the case sufficiently to receive the pulley and stuffing box.

It would seem that this simple and powerful rotary ought to have become a permanent success. It was estimated that the ends of the arms moved at the rate of from 5 to 7 miles a minute under a boiler pressure of 80 pounds to the inch, but whether its speed was more or less than this estimate, it is evident that it was the element of speed which gave it its power, and for the lack of skillful workmanship and perfect balancing in the shaft and arms, speed was also the cause of its rapid deterioration. I am inclined to the belief that with the help of our best modern skill and appliances engines upon this reactive principle may yet become a success.

F. G. WOODWARD.

Heating Foundries—Foundry Foremen and Employes—Mica for Covering Risers.

Editor American Machinist:

In the AMERICAN MACHINIST of Nov. 13, the heating of foundries by steam is mentioned, and I cannot fully agree with Mr. Spence. Mr. Spence says a more uniform heat can be produced by steam than by stoves. I will not attempt to say this is not so, but I will say this, that as long as the place to be heated by steam is not subject to prolonged drafts of cold air, dampness, and the like, it may work. It may do in a machine shop, pattern or carpenter shop, or in a foundry where a certain class of work is done that does not require running out for flasks; it would do in a stove shop where the same work is done every day the year round. But in a jobbing foundry, where the doors are opened more or less, it won't do.

I worked in a shop where the proprietors were anxious to make the foundry as comfortable as possible, so they put steam into the foundry. The joists were about 16 feet from the floor, and upon these joists were placed about 200 feet of $2\frac{1}{4}''$ or $2\frac{1}{2}''$ boiler flues, and at one end of the shop they put about 50 feet more, and in the center of the foundry the stove stood. While I appreciated the efforts of the proprietors to make it comfortable, yet I could not see much benefit of the steam without the stove. One day I concluded to test the heating powers of the steam pipes. In my foundry memoranda book I find the following: January 17, 1884, temperature outside, 28°; inside with steam and stove burning, 56°; without stove, and steam alone, 41°; with stove alone, and without steam, 53°. So the difference between the outside and inside temperature was 10°, and the difference in temperature after the steam was turned off was 3°. The size of the shop is, I think, $32' \times 50'$.

The trouble in heating a jobbing foundry is this: Men are going out and in more or less bringing in flasks; cold air rushes in, the flasks are covered with ice and snow; the temperature of the shop is brought very low, and before the shop is warmed again the doors are open again; then again, say two or three men go out after a flask in severe weather; after digging it out of the snow and bringing it in, their fingers and feet are very cold. How long would it take for them to get warm (especially a moulder who is dressing a mould) so as to feel comfortable? A good stove would do it in a few minutes; a steam pipe overhead would not do it in 30 minutes. A stove may not heat as uniformly, and may require more attention, but for quick heating and a warm shop give me the stove, especially in a jobbing foundry. As for expense, it costs more sometimes for repairing bursted steam pipes than the firing of a stove.

Superintendents, managers, and foremen, should profit by the article on shop management by Superintendent.

If you would have the respect of your employes show a little respect to them. Another thing, do not imagine every man employed by you is merely trying to worry the day in and not giving valve received for his wages. If your men do a good job don't be too narrow-minded to say so. One approving look is worth a hundred looks of indifference.

I would be the last man to detract from another moulder's merits, but I think Mr. Daniel Cunningham (of whom R. E. Masters speaks in the AMERICAN MACHINIST of November 6) and the writer are laboring under the same delusion. In my practice I have used mica for covering risers on moulds for some time. I first tried glass, but I found that when the iron entered the mould the gases and steam would dampen and blacken the glass, and when the mould was partly filled the glass would get hot and crack; it would then be useless. Then I tried mica and found I could use it successfully. I had never seen or heard of it being used before; I merely thought I would try it, as I did not want to lift the covers off the risers when casting a heavy piece; however, Mr. Cunningham and I will say we were the first to do so, until some old timer steps in and lays us both out.

F. B. SHAFFER.

Lancaster, Pa.

Hanging a Grindstone.

Editor American Machinist:

I found, the other day, a man getting ready to hang a new grindstone. The old one had been lifted out of the frame, and the arbor taken out and fitted to the center of the new stone. Thus far he had proceeded in the ordinary way. But instead of tipping the frame up on one end and rolling the stone into it, and then tipping the whole thing back again, either breaking or severely straining two of the legs, he found out how much the stone would clear the floor when hung, placed a block of that height on the floor where the stone was to stand, rolled the stone up on it, took the arbor out, lifted the frame over the stone and put it down on the floor, put in the arbor, knocked out the block, and was ready to grind in half the time it would have taken him to have done the job in the usual way.

F. L. JOHNSON.

Waukesha, Wis.

How an Engineer Got Ahead of the "Unexpected."

Editor American Machinist:

I send you an account of an accident that happened on the Mobile and Girard Railroad, near this place, in which a brainy young engineer came out ahead of the "unexpected, which often happens." He was running an "extra;" while going at full speed between two stations, he attempted to open the throttle at the foot of a short grade, and the stem broke entirely off about $\frac{3}{4}$ of an inch inside the gland. Fortunately the valve closed. Being several miles from a meeting point, he was in a "fix," but he belongs to that class of progressive young runners who never allow themselves to remain "fixed" for any length of time. So uncoupling from his train, he used his tallow pipes to convey steam to the cylinders, thereby enabling him to run the engine to station, where he arrived on time. There he reported to headquarters, and while waiting for orders, took the engine of the regular to sidetrack his train. Receiving orders to "bring her in if possible," he proceeded to do so in the following manner: The throttle valve was of the old style **V** pattern with the throttle-box in smoke-box. He found on "monkeying" a little that by keeping cylinder cocks closed and opening tallow pipe plugs or valves, allowing steam to pass through the cylinders into the steam pipes, that it was very near balanced. He then screwed the gland up hard until the broken stem came within $\frac{1}{8}$-inch of the end, and taking an old chisel, which he used as a caulking tool, he caulked or riveted the end until it was perfectly tight in the gland. By holding the stem in this way he was enabled to screw the gland in and out, working the valve sufficient to run the engine to the shops, a distance of 30 miles. By using reverse lever and the brakes, he had complete control of train.

After filling the cylinders and steam pipes by means of the tallow pipes, a throttle valve of the old **V** pattern will invariably fly open of itself.

W. A. COLLIER.

Macon, Ga.

Some Pressure Tests.

Editor American Machinist:

An opportunity was had last summer to witness some tests made to determine the accuracy of steam gauge springs. It came about in this way. An engine was not doing the work it was thought it should do, so to discover what was going on in the inner engine, an indicator was attached, which revealed the trouble at once, viz.: a lack of pressure. The cards were taken with the governor valve and throttle both full open, and showed about sixty pounds initial pressure, while the "boiler pressure" was ninety-five.

The boiler pressure was shown by a steam gauge attached to steam pipe by a small brass cock. The indicator was connected to steam chest to see if the lack of pressure was due to contracted ports or faulty valve construction, but the pressure was but a trifle greater in the chest than in the cylinder. The indicator man now concluded the steam gauge to be incorrect. The engineer said the gauge was a good one and had been tested but a short time before and found to be O.K. The engineer proposed testing the indicator spring, which was done as follows: The indicator was taken off above the cock at the union, and taken to a pair of scales. A piece of quarter inch steel wire was placed against the bottom of piston and projected some two or three inches. The indicator was now placed on the scales, resting on the wire, and held in as nearly vertical position as possible. A card had been previously put on and the air line drawn. Weight was now applied to the indicator until the pencil had raised an inch; the weight was now found to be twenty pounds. The scales now were set at forty pounds and weight was applied to indicator till the beam raised, when a line was drawn on card; the card was taken off and the distance from the air line to the one just drawn was found to be very nearly two inches, showing it to be a tolerably accurate forty pound spring.

The engineer admitted the accuracy of the spring, but thought the piston leaked so badly that there was a counter pressure on top of piston, and was therefore an element of error. The indicator man now proposed testing the steam gauge, something after the style of testing cast iron specimens illustrated in the AMERICAN MACHINIST some time ago, which was done the next day as follows: A small cylinder open at the top, with a hole in the side or the bottom to receive a flexible pipe (rubber hose) was placed on the same scales as were used to test indicator spring A nicely fitting piston, bored out on top to receive a pointed rod, was inserted in the cylinder on the scales. The rod was now placed in the piston and under a cross beam on top of scales. The steam gauge in question was placed in the steam pipe leading to cylinder. When everything was ready the scales were balanced with everything on except piston and rod. The piston had an area of just two inches. Steam was turned on and the scales, which were new and in good order, showed a weight of from 150 to 170 pounds. The gauge showed 80 pounds, which corresponded with the average weight shown on the scales. The stiff action of the scales was attributed to the friction of the piston in the cylinder, which was afterward proved to be correct. The area of the piston was reduced by bushing the cylinder to one inch area and the friction was lessened. The area was reduced to one half inch area, and finally to one-fourth, when the scales worked quite freely and the actual pressure determined within two or three pounds.

The experiment was getting quite interesting now, the testing of the gauge was forgotten in trying to overcome the friction of the piston, so that the exact pressure could be told. It was proposed that a spring should be placed on the piston for it to press against, instead of a rigid body. This was done but the result was no better. It was then proposed that the piston be revolved while the pressure was on. This was tried and every sign of friction had vanished; the scales working as freely as they would under any load, and to the surprise of everyone the scales showed just one-fourth the weight that the gauge did. The gauge was correct, also the indicator, beyond a doubt.

The atmosphere was fairly thick with various ideas concerning the tests, which were original with the ones who proposed them, and new to all who saw them made. The steam gauge was now taken back and attached in its usual place to the steam pipe, but did not show the same pressure that it did when taken down, by about twenty pounds. Here was something strange again, for the pressure was known to be as high when it was put on as when taken off. The pressure was allowed to fall in order to see if there could be any chance for mistake in the safety valve (which was kept blowing, or nearly so, all the time) when to our surprise the gauge began to show an increased pressure.

These incidents were related to a boiler inspector soon after they occurred, who explained the whole business in a few words, saying that bent tube steam gauges should not be attached without a syphon or other means of keeping the spring cool, something every one had heard over and over again, but in this case had been strangely forgotten by all. But there is one thing which these tests has led me to believe, and that is, that the friction of an indicator piston is a very considerable amount and has a great deal to do with the distortion of cards, especially if taken at very high speeds. The indicator is susceptible of improvements inside as well as outside. If a rotary motion could be given to the piston without interfering with it otherwise a much more perfect card would be the result in the opinion of your obedient servant,

C. O. SINE.

NEW SCREW DRIVER.

Boiler Defects.

The inspectors' reports of the Hartford Boiler Insurance Company of July show that during the month 3,527 visits of inspection were made, and 6,952 boilers were inspected, 3,450 of them both externally and internally. Out of the lot 34 were condemned as unfit for further use. The defects discovered amounted in number to 6,019 of which 552 were dangerous. The largest number of defects of a single kind were cases of defective riveting, 1,396 of which were considered dangerous. In commenting upon this fact the company say in the *Locomotive:*

"The greater portion of the defective rivets reported above were found in new boilers, while they were under hydrostatic pressure in the yards of their makers. A large proportion, also, of the leaky tubes and seams were discovered under the same circumstances, but the proportion of the latter two defects thus discovered was much smaller than the proportion of defective rivets. This may be accounted for by the fact that a rivet once properly driven is bound to always remain all right, under ordinary circumstances, while seams, and the joints around tube ends rapidly deteriorate under many conditions to which they may be subjected in every-day use.

"Ordinary machine riveting probably results in a greater proportion of defective rivets than any other one cause. Machine riveting to make good work must be very carefully done. The rivet hole must be truly in line with the machine dies. The holes in the two plates must also be in line with each other. If there is an offset of an eighth of an inch between them, the rivet is bound under any circumstances to be a very bad one.

"The most satisfactory riveting of boiler plates is done at the present time by a properly constructed and used button set. By this means better seams can be made than by hand riveting. The work is also done more expeditiously than it can be done by the old method. A well-constructed machine will enable the work to be done considerably quicker than it can be done with the set, but we have rarely seen a complete job of machine riveting which left nothing to be desired. It was not the fault of the machine, however.

"In hand riveting the excellence of the joint depends entirely upon the skill of the riveters; in button-set riveting, much depends upon the form of the set. With an improper set it is impossible to do good work, no matter how skillful the workmen may be.

"Button-set riveting has been tried in many shops and abandoned as impracticable. Experience in other shops, where it is perfectly successful, would seem to indicate that the failures have not arisen from any defect in the principles underlying the process, but rather from a failure on the part of those trying the process to fully grasp the problem."

What the Society of Mechanical Engineers Will Do.

Secretary Hutton, of the American Society of Mechanical Engineers, has sent out to members a programme for the seventh annual meeting to be held in the City of New York, November 29th to December 3d. The chairman of the local committee of arrangements is Wm. H. Wiley, 15 Astor Place.

The sessions will be held in the hall of the New York Academy of Medicine, No. 12 West Thirty-first street, between Fifth avenue and Broadway. The headquarters of the Society will be at the Convention Rooms.

The members will assemble Monday evening, November 29th, listen to the president's address, eat supper, shake hands all round, tell a few stories (relating to engineering of course) and otherwise get themselves in excellent condition for the business session, which begins Tuesday morning at 10 o'clock. The afternoon session begins at 2 o'clock. Tuesday evening is set apart for attending the American Institute Fair. Those who think the Fair is hardly interesting enough, will doubtless find attractions elsewhere in the city. On Wednesday an excursion by boat to Newark has been planned. On the return the boat will stop at Bedloe's Island long enough for the members to pay their respects to Miss Liberty. Lunch will be served on board. In the evening another business session will be held at the Medical Academy.

On the fourth day (Thursday) the society will hold a 10 A. M. and 3 P. M. session within the classic walls of Stevens Institute, Hoboken. The programme is so specific in describing where Hoboken can be found that we don't believe any of the members can miss it; but if any of them should become confused and get astray, a committee will hunt them up, and bring them in for the lunch which has been tendered by President Morton at his house, at 1 P. M.

Friday will be devoted entirely to an excursion to Trenton, the P. R. R. having tendered a special train for the occasion. While there, the society will be the guests of Mayor-elect Hewitt's establishment, where the members will be shown how wires are manipulated—wire drawing, we mean—and how iron beams for buildings are rolled. They will not go away hungry.

The following papers are to be presented and discussed at this meeting:

Francis Reuleaux: "Friction of Toothed Gearing."

R. H. Thurston: "Friction of the Non-condensing Steam Engine."

Benjamin Baker: "The Working Stress of Iron and Steel."

A. Wells Robinson: "Dredging Machinery."

Andrew C. Campbell: "A New Conicograph."

Gaetano Lanza: "Strength of Shafting Subject to both Twisting and Bending."

Wm. Kent: "Heating Capacity of Water Gas."

Geo. I. Alden: "Formulæ and Tables for Calculating the Effect of Recip. Pts. of High Speed Engines."

William Cowles: "Fire Boats."

Geo. H. Barrus: "New Calorimeter."

Oberlin Smith: "Intrinsic Value of Special Tools."

W. E. Partridge: "Capital's Need of High-priced labor."

Subjects and queries will also be presented for the "Topical Discussions."

Toledo, Ohio, is looking forward with much hope to the early introduction of natural gas for manufacturing and domestic purposes. A strong company has been formed, and right of way has been obtained for a pipe line to bring what is believed to be an ample supply from important gas wells recently discovered about twenty-five miles southeast of the city. If a good supply of natural gas can be furnished at suitable prices, the recent tendency to turn from commercial to manufacturing activity, specially manifest within the last year or two, is expected to give the city a boom. D. R. Locke, otherwise known to fame as "Petroleum V. Nasby," is the one public-spirited citizen most entitled to credit for bringing about this tendency. He has not only taken a financial interest in a number of manufacturing concerns, but has put up a number of substantial factory buildings, which he leases on very favorable terms to manufacturers. The population has increased from 50,000 to 72,000 within the past five years. Its abundance of cheap homes and central location should make Toledo an important manufacturing point, if the manufacturing spirit is properly cultivated by its citizens.

New Screw Driver.

The new screw driver illustrated on this page is a novelty brought out by Paine, Deihl & Co., Philadelphia. It is made of a single piece of wire, and is meeting with public favor.

The Watts-Campbell Co. Engineer Corps of Newark, N. J., will have their first annual parade for rifle practice and recreation on Thanksgiving day. The shooting is to be for prizes.

The Chinese laundrymen of New York have decided to form a trade-union for the purpose of keeping up the rates on their work, and will fine every Chinaman who does not join, or who cuts rates, $100, boycotting him if he fails to pay. These heathen have learned how to proceed "allee samee Melican man."

For the past three months Thomas D. West has, with his valuable experience as a moulder, aided the Cowles Electric Smelting and Aluminum Company in starting their foundry at Lockport, N. Y. Leaving everything in fine working order, he has returned to his family in Cleveland, and his old position as foreman of the Cuyahoga Works Foundry.

At the present time there is being tried at New York, and also at Philadelphia, electric motors on surface railroads. It seems evident, from the attention that is being given the subject, that surface road managers are looking for something to take the place of horses, and they ought to find it. Considerable progress has been made in cable propulsion, the choice at present seeming to be between that and electric motors.

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NEW YORK, NOVEMBER 27, 1886.

CONTENTS.

	PAGE
Sketch of the Life and Work of John C. Hoadley.	1
Natural and Artificial Gas	2
Making the Schools Practical	2
Pernicious Engravings	2
Practical Drawing. By J. G. A. Meyer	3
Preparing for Master Mechanics' Reports	3
Hand Drills	4
Railroad Shop Notes	4
Return Tubular Boilers. By William Lowe	4
Twenty by Sixty-Inch Traverse Shaper	5
Letters from Practical Men—Moulding Pulleys By Thomas Wathey—Wear of a Crank-Pin. By W. E. Crane—Mixing Soda Water. By C. E. Simonds—Information Wanted—An Expanding Mandrel—Turning Tapers. By Charles S. Beach—Adapting Work to Suit Customers. By Benjamin F. Hetherington—High-Speed Rotary Engine. By F. G. Woodward. Heating Foundries—Foundry Foreman and Employes—Mica for Covering Risers By F. B. Shaffer—Hanging a Grindstone. By F. L. Johnson—How an Engineer Got Ahead of the "Unexpected." By W. A. Collier—Some Pressure Tests. By C. O. Sine	5, 6, 7
Boiler Defects	7
What the Society of Mechanical Engineers Will Do	7
New Screw Driver	7
Usefulness of Labor Bureaus	8
Fuel from Culm	8
Literary Notes	8
Questions and Answers	8
Business Specials	9
Manufactures	9
Machinists' Supplies and Iron	10

Usefulness of Labor Bureaus.

It is refreshing to see the Bureau of Statistics of Labor, of the State of New York, making some effort to gather labor statistics. Two blank forms in regard to apprentices have been sent out; one contains 56 questions for apprentices to answer, and the other 28 questions for owners of shops and establishments to answer. Both catechisms seem to be well prepared, and ought to elicit much useful information. Since the election is past, and the exciting work of a political campaign no longer claims a share of his attention, we trust that Commissioner Charles F. Peck will be enabled to devote himself continuously to the work of the bureau. When the public has heard from Mr. Peck through the daily papers, it has generally been upon political prospects, and seldom upon labor matters. Just before election he gave his views, through an interview in a daily paper, about the prospective vote for "our party" in various parts of the State. While a commissioner of labor statistics has the same right to exercise his political party preferences as any other citizen, it is not in keeping with the character of his office to make them conspicuous. As a rule, the less he tries to shape the course of party matters, the more useful he will be in collecting and publishing important industrial facts. How widely known are the party preferences of heads of labor bureaus in Ohio, Massachusetts, Pennsylvania, Illinois and New Jersey? We have never heard to which party either of them owes allegiance, and feel certain that comparatively few of those who have been benefited by their reports know what ticket any one of them favors. These men, however, are known by their works. They have not been brought into prominence by interviews on party matters, but by patient, persistent work in bringing to light truths about industrial establishments and the men, women and children who pass a large part of their lives therein. By a judicious presentation of these truths by heads of labor bureaus, much wholesome and necessary legislation has been secured, but much more remains to be done.

There never was a time in this country when bureaus of labor statistics could do more for public benefit than now, and they ought to be strongly supported. The prominent part taken in the recent elections by workingmen indicates that they have some grievances to be righted by statute. It is useless to ask self-constituted, one-idea reformers to formulate these grievances. It needs careful study to find what remedies are really needed. There is not a labor grievance that can be righted by statute that a bureau of labor statistics cannot uncover and suggest to legislative authorities some law to correct. It is absolutely necessary, however, that the head of the bureau shall be a man to command the respect and confidence of the masses who toil. The five States we have named are fortunate in this respect, but the State of New York is singularly unfortunate. The sooner a change is made in the management of the Labor Bureau at Albany the better it will be for the industrial interests of the State. In no other State have there been greater manifestations by workingmen of deep seated dissatisfaction with the kind of laws enacted and the partiality displayed in enforcing them than in the Empire State. With an efficient labor bureau the evils could be properly brought to public notice and righted.

Fuel from Culm.

We publish elsewhere some extracts from the report of the Scranton (Pa.) Board of Trade in regard to the possibilities of artificial gas made from culm or waste coal. Of course the expression to the effect that the supply of natural gas will soon be exhausted is merely an opinion; no one knows with any approximation to certainty how long it will last, or that it is not practically inexhaustable. We do not see that this makes much difference, unless, indeed, natural gas shall eventually be found everywhere in the country, which is not probable.

The accumulation of culm is, as will be seen by the report, enormous, and making due allowance for over-enthusiasm in relation to the cheap cost of producing gas from it, it is still evident that there is in what has been considered waste an immense potential energy that can be cheaply utilized; its utilization, if accomplished half as cheaply as it is claimed that it will be, is a matter of great importance.

It has been quite fairly demonstrated by the use of natural gas that gaseous fuel has important advantages over solid fuel for many industrial purposes, and should the supply of natural gas fail in the regions where it is now used efforts will doubtless be made to substitute artificial gas rather than return to the use of coal. In places remote from the supply of natural gas the interest in cheap artificial gas is constantly increasing. Altogether the Scranton Board of Trade has presented in its report the outlines of a great economical question.

The cross sights of surveyors' instruments are now largely made of platinum wire. The wire used for this purpose is drawn to a diameter of about one twelve-thousandths of an inch. To accomplish this fine drawing platinum wire three one-thousandths of an inch is covered with silver, bringing the diameter to one-tenth inch. This is then drawn so as to give the diameter of platinum core required, then the silver is eaten off with acid, leaving the platinum wire.

German manufacturers have again gained an advantage over British competitors, by receiving an order from the Turkish government for three torpedo boats, to have a speed, respectively, of 25, 23 and 20 knots. The boats are to be armed with Hotchkiss guns and Swartzkopf torpedoes.

According to the report of James A. Dumont, Supervising Inspector General of steam vessels, there were, during the past year, 40 accidents to steam vessels causing loss of life. Of these accidents 13 were from explosions, costing 34 lives. The number of vessels inspected was 5,744, and 13 explosions in this number seems a large percentage. We believe that if there were less red tape in the matter of appointing and retaining inspectors—if the matter were left entirely in the hands of a competent man like General Dumont—there would be fewer explosions.

Literary Notes.

The *Earth* is the name of a new weekly paper just started at 430 Walnut street, Philadelphia. "The fullness thereof," if the first number indicates what is to follow, is of a varied character. The principal editorial is on "Gold as Money." After mentioning what countries have adopted the gold standard, it says: "Knowing the weight adopted by any nation we easily find the value in United States money by dividing it by 23.22." No we don't, because the standard fineness of gold used for coinage varies in different countries. For instance, British gold coins are finer than American coins. Let the *Earth* attend to accuracy as well as fullness and it may succeed.

Our esteemed contemporary, the *Sanitary Engineer*, announces in last week's issue that the title is now "*The Sanitary Engineer and Construction Record.*" In noting the change it says:

"The words 'Construction Record' have been adopted with a view to conveying to those not generally acquainted with the character of its contents the scope of the subjects treated, which include those properly belonging to a weekly journal devoted to engineering, architecture, construction, and sanitation."

Exchanges are requested to give the whole title when crediting quotations. The record of new construction is a special and valuable feature of our contemporary, and much effort and expense have been put forth to make it full and reliable.

QUESTIONS AND ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common-sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials nor location will be published.

(403) J. C., Boston, Mass., asks: What is the rule for finding the mean pressure of expanding steam at a given point of cut-off? *A.*—The rule best adapted for the purpose requires the use of a table of hyperbolic logarithms. You will find such a table in almost any work on steam engineering, or on the use of the indicator; also the required rule.

(404) G. L. F., Ashland, Va., asks: Where is it best to put the fly-wheel of an engine, and does it make any difference as regards friction? *A.*—A fly-wheel should be as near the crank as it is practicable to place it. It is said that the friction due to the weight of fly-wheel increases with its distance from the crank, more particularly with a vertical engine. We cannot say to what extent this is true in practice; but, as the fly-wheel resists the motion of the crank during part of the stroke, it is manifestly better to have this resistance as near the point where the power is applied as possible.

(405) C. W., Carbondale, Ill., and others, will find instructions for japanning in the AMERICAN MACHINIST of April 12, 1884.

(406) Z, ——, asks several questions as to the relative strength of hollow and solid columns, bars, etc. The consideration of this subject is quite too lengthy to be compassed by one or two questions and answers. It will be found fairly well treated in such pocket books as Trautwine's and Haswell's, to which we must refer our correspondent.

(407) A. H. A., Greenville, Cal., asks: 1. Will the strain be greater on a 6″ lifting pump, when raising water through a 12″ pipe, than when a 6″ or 7″ pipe is used? *A.*—No. If there is any difference, it will be in favor of the large pipe, because there is less friction in a large pipe than in a small one. 2. Will it require more power to raise water through a 6″ pipe with an 8″ pump than if the pipe were same size as pump. *A.*—We suppose, without knowing particulars, that the 6′ suction pipe is practically large enough. 3. How much water will it take to give 150 horse-power with a 50-foot overshot water wheel, and what is the rule for determining this? *A.*—The theoretical horse-power of a waterfall is found by multiplying the weight of water per minute by the fall in feet, and dividing by 33,000. Good overshot wheels are said to utilize about 75 per cent. of this; hence the full power of the fall must be 200 horse-power. One cubic foot of water per minute (62.4 lbs.) will give

$$\frac{62.4 \times 50}{33000} = .094$$

horse-power, and 200 horse-power will require 200 ÷ .094 = 2129 cubic feet of water per minute.

(408) W. W., Texas, asks: 1. How is it that when the link motion of a locomotive is placed in an intermediate position between full gear and mid gear, the slide valves will not cut off square? *A.*—This is the result of placing either the link saddle pin or the lifting shaft, or both, in the wrong position; and sometimes it may be the result of a faulty design of the whole link motion. 2. What is the proper method for laying out the notches in the reverse lever quadrant? *A.*—The method generally adopted is to place the link motion into full gear, and mid gear for forward and backward motion, marking off the position of the latch on the quadrant when the reverse lever is in any one of these positions, and then between these lay off as many notches as may be desirable. Some master mechanics prefer to place the intermediate notches in a manner which will enable them to tell at what part of the stroke steam is cut off; others, again, prefer to place the notches as close as the strength of the material will allow.

(409) R. L., Leominster, Mass., asks: What are the elementary principles of mechanics? *A.*—Consult an ordinary school-book on natural philosophy. What of mechanics you find explained there you may consider elementary principles.

(410) Link, Penn., writes: In a locomotive link motion the saddle pin is placed behind the link arc to effect equal cut-offs in the half-stroke position by causing the hanger to vibrate, when the link is in this position, in an arc whose chord is parallel to center line of motion. Why is it, then, that in most locomotives the lifting arm is parallel to the center line of motion? For the arc of vibration being inclined, when the link is in full gear, to give equal cut-offs (not equal lead), would then be also inclined to center line in all other positions of the link? *A.*—In all our experience, we have always seen the valves of a locomotive set with equal lead (not equal cut-offs) at full stroke; this will make the cut-offs at full stroke very nearly equal, the difference being so small that it may be neglected. In cases of this kind the center line of lifting shaft arm will be parallel, or nearly so, to the center line of motion, but it does not necessarily follow that it always should be so.

(411) D. H. L. writes: Can you tell me the best way to get rid of the exhaust steam in a mine? We use Knowles' mining pump, and the exhaust makes the mine very unpleasant on the side where it runs. *A.*—If the pump is small, send to Knowles' Steam Pump Works for one of their new special condensers, which can be fastened to the suction pipe. If the pump is large, you will need an independent air pump and condenser.

(412) J. R. J. asks: 1. What was the highest horse-power indicated by the Corliss engine at the Centennial Exposition? *A.*—The highest power indicated by this engine at the Centennial Exposition is not known; only a part of its highest power was developed. 2. What is the average power the engine is now developing at Pullman's Palace Car Company? *A.*—About 1,250 horse-power.

(413) T. W., ——, writes: 1. Can you give me a good receipt for polishing brass on a locomotive? *A.*—Rub the brass with waste dipped into a mixture of rotten stone and oil. 2. Is there any way to keep it from tarnishing after scouring? *A.*—No. 3. What is meant by the steam working expansively when the valves cut off? *A.*—When steam, by its expansion, moves the piston, it is said to work expansively. 4. What would you do when an eccentric strap or rod is broken on the road—to run the engine into the shop? *A.*—First, we should take off the broken rod and strap; second, disconnect the valve stem from the rocker, and fasten the slide valve in the middle position of the valve seat; third, fasten the piston against the cylinder head, and then run the locomotive with one cylinder. 5. Which end of the cylinder receives the greatest pressure of steam? *A.*—The front end of cylinder; in the back end of cylinder the pressure is decreased by the area of piston rod. 6. How do you get the length of a link? *A.*—In large locomotives the length of the link measured on the link arc is generally 18 to 20 inches, and the distance between the eccentric rod pins is generally 12 inches. For smaller locomotives these dimensions are somewhat decreased.

BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Shafting Straighteners. J. H. Wells, Tampa, Fla.

J. Clayton, Air Compressors, Rock Drills, 43 Dey st, NY

Edw. Sears, Wood Engraver, 169 William st., N.Y.

Steel Name Stamps, etc. J. B. Roney, Lynn, Mass.

Solid Nickel-Seated "Pop" Safety Valves. Consolidated Safety Valve Co., 111 Liberty st., N. Y.

Selden Packing, for stuffing-box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., NY

The Best Upright Hammers run by belt are made by W. P. Duncan & Co., Bellefonte, Pa.

Light articles built to order by the American Sewing Machine Co., Philadelphia, Pa.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Davis Key-Seating Machines, kept in stock, by Manning, Maxwell & Moore, 111 Liberty st., N. Y.

Pattern and Brand Letters. Vanderburgh, Wells & Co., cor. Fulton and Dutch sts., New York.

20", 25," 28" B.G. and S. F. upright drills for immediate delivery. Currier & Snyder, Worcester, Mass.

The best wire nail and tack and nail machinery. Wm. A. Sweetser, Brockton, Mass.

Ice and Refrigerating Machines. 120 built, and all successful, by David Boyle, 521 Monroe, Chicago, Ill.

Inventions, Models, Gear-cutting and light mechanical work. A. P. Brown, 108 Liberty st., N. Y.

20,000 addresses of steam users and users of mach. in 10 States, $10. J. N. Mills Pub. Co., 30 Vesey st., N.Y.

"How to Keep Boilers Clean." A book mailed free, by James E. Hotchkiss, 93 John st., N. Y.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys Yocum & Son's Shafting Works, Drinker st., Philadelphia, Pa.

For Best Return Steam Traps, Pressure Regulators, Positive-Acting Pump Govs., Back-Pressure Valves. T. Kieley, 11 W. 13th st., N.Y. Send for des'n.

Curtis Pressure Regulators, Curtis Return Trap. Curtis Damper Regulator. See Nov. 13, p. 12. Send for circular No. 17. Curtis Reg. Co., Boston, Mass.

Engine Lathes, Hand Lathes, and other fine tools. Assortment large; prices low. Frasse & Co., 92 Park row, N. Y.

Rubber Belting, all sizes, 77½ per cent. regular list. All kinds of Rubber Goods at low prices. Jno. W. Buckly, 156 South street, New York.

Machinists' supplies, brass goods m'f'rs supplies, polishing materials, all kinds wire, metals, etc; in any quantity. Jordan & Gottfried, 208 Canal st., N.Y.

The Improved Tabor Steam Engine Indicator, made and sold by The Ashcroft Mfg. Co. 111 Liberty st., N. Y.

For Sale—A Circular Cold Sawing Machine for cutting iron or steel rails, joists, girders, T iron, etc.; can be run by hand or power; gives a clean and accurate cut, avoiding fractures and saving time; having been purchased in trade, will be sold very reasonable. For particulars and price, address Fedrick & Ayer, Philadelphia, Pa.

St. John Improved Self-adjusting Cylinder Packing, for marine and stationary engines and locomotives; applicable to water, air, oil and ammonia pumps. For durability and minimum of friction, it is unexcelled. Send for pamphlet. Address, Balance Valve and Piston Packing Co., room 58, 280 Broadway, New York.

Patent Binders for the AMERICAN MACHINIST, holding a complete volume (52 issues), simple, neat, durable. Price $1, prepaid, to any part of the United States by mail. To Canada or foreign countries the price will be 75c.; purchasers pay express charges and customs duties. AM. MACHINIST PUB'G CO., 96 Fulton st., N. Y.

"Indicator Practice and Steam Engine Economy." By F. F. Hemenway. Contains plain directions for using the indicator, and making all required calculations from the diagram; also the principles of economy in operating steam engines, and current practice in testing engines and boilers. Price, $2 post-paid. Published by John Wiley & Sons, 15 Astor Place, New York

MANUFACTURES

Pitt & Ramer will erect a new carriage factory at Des Moines, Iowa.

The Wilder Chilled Plow Company, of Caledonia, N. Y., will remove its factory to Rochester.

The Bethlehem Iron Company, of Bethlehem, Pa., is erecting another large building.

It is reported that the Lowmoor Iron Company, Lowmoor, Va., will erect an additional plant.

Lorenz Schmidt, of Pottsville, Pa., will build a new brewery at Mt. Carbon, to cost $50,000.

Knowlton Bros., of Camden, Me., are making extensive improvements to their foundry.

S. Cheney & Son, Manlius, N. Y., have purchased another building for a foundry.

It is reported that new machine shops will be built by A. C. Osborne, Clarksburgh, W. Va.

John A. Lee is erecting a coppersmith works and brass foundry at Chattanooga, Tenn.

The Alabama Car Works at Eufaula, Ala., are about to reorganize and build cars.

Rice, Lane & Phillips, St. Paul, Minn., will erect a foundry building to cost $13,000.

Everything indicates the early erection of four blast furnaces in Sequachee Valley, E. Tenn.

Lewis & Egginton, 1142 De Kalb avenue, Brooklyn, N. Y., will erect an iron foundry, 32x75 feet.

Natural gas has been introduced into the Cambria Iron Works at Johnstown at a cost of $100,000.

Donaldson Bros., of Mt. Clemens, Mich., will erect a two-story brick addition to their machine shop.

Steps are being taken towards organizing a shoe manufacturing company in Warren, Mass., by J. Wheaton Allen and others.

Vandevoort & Tucker, New York city, will erect on 117th street, near Pleasant avenue, a two-story brick factory, 80x80 feet.

The Georgia Central Railroad Company has purchased a site in Birmingham, Ala., on which to build a machine shop.

A new factory for the manufacture of reapers and mowers will be erected in Martinsburgh, Pa. Daniel Snowbarger is interested.

F. S. Myers, 619 Broadway, New York, will raise his factory two stories higher, at a cost of $5,400. It is located at 410 East Sixty-eighth street.

The Beaver Falls (Pa.) Cutlery Works have been sold to capitalists at Bridgeport, Conn. They will employ about 600 hands.

Ground has been broken on North avenue, Natick, Mass., for a new carriage factory to be occupied by Piper & Co.

The Pratt Coal and Iron Company, of Birmingham, Ala., contemplates building four furnaces, 1,000 coke ovens, a basic steel plant, etc.

Thompson Bros., Tyro Shops, N. C., contemplate starting a foundry and agricultural implement factory at Salisbury.

R Belt, Logan, Ohio, has sold his foundry to Zschech & McLain for $15,000. The new firm will make a specialty of band saws.—*Iron Trade Review.*

The Texas and Pacific Railroad Company will build an additional car shop, 40x130 feet, at Marshall, Texas.—*Baltimore Manufacturers' Record.*

The Piscataquis Woolen Company, Guilford, Me., contemplate purchasing a steam engine, so that their mill will not have to be shut down in case of a severe drought.

A company with a capital stock of $100,000 will be formed at Atlanta, Ga., to manufacture ice machinery. Frank A. Smith, Steelton, Pa. is interested.

The Dwight Slate Machine Company, Hartford, Conn., have perfected a machine for making carpenter's squares, which will finish them at the rate of one per minute.

The firm of Henry R. Worthington, Brooklyn, N. Y., will erect a brass foundry in connection with their steam pump works. It will be 80x26 feet, and is to cost $3,500.

A machine shop and planing mill are soon to be erected at Chippewa Falls, Wis., by the Mississippi River Logging Company. F. Weyerhausen, president.

A co-operative company, composed of Knights of Labor in the vicinity of Olean, N. Y., have nearly completed oil refining works of 1,000 barrels capacity per week.

A new silk factory is to be built at Norwich, Chenango County, N. Y., the stock being about all taken. The firm which will operate this factory has agreed to employ 130 hands

The Fuller & Warren Company, of Troy, N. Y., will not rebuild the burned factory at Schenectady at present. They will decide next spring where the new foundry will be located.

B. A. Jenkins, Charles Dawes, C. Cullen, W. H. Geers, J. N. Qualfe and others have incorporated at Knoxville, Tenn., the Frankland Foundry and Manufacturing Company, to manufacture stoves, plows, etc.

The Co-operative Foundry Company, of Rochester, N. Y., have the foundation laid, and are pushing the construction of an extensive brick foundry and shops on the line of the Central Railroad, about two miles from the city.

The Ivanhoe Paper Mills Company, of Paterson, N. J., have just ordered of the National Water Tube Boiler Company, of New Brunswick, N. J., 216 horse-power of their water tube boilers (Moore's system).

J. H. Spellmeyer & Co. have opened a machine shop at 712 Howard street, St. Louis, and propose to build various classes of machinery and do general repairing. Another lathe and planer will soon be added to the company's equipment.

The Laclede Car Manufacturing Company, of St. Louis, contemplate an enlargement of their mill. Orders at the present time are crowding them so hard as to force the admission that "we are as full of work as we can be."

The Manhattan Elevated Railroad of New York city will order twenty-five new locomotives and one hundred new cars to accommodate the increased travel which has come since uniform five-cent fares became the rule.

Jacob Reese, of Pittsburgh, inventor of the basic process of making steel, has sold the right to use his process to the Sloss Furnace Company, of Birmingham, Ala. The company will at once erect a plant for the manufacture of steel on a large scale.

The $50,000 stock company lately reported as formed at South Pittsburgh, Tenn., to build pipe works, has been organized, with G. E. Downing as president and treasurer; James Bowron, of Nashville, vice-president; and W. R. Townsend, secretary. Work has been commenced.

J. B Reynolds, shoe manufacturer, Brockton, Mass., has had some differences with his workmen, and proposes to move his business elsewhere. The business men of Orange, N. J., are raising $10,000 capital stock to build Mr. Reynolds a factory, and give him rent free for five years.

The Lymansville Mill, at Lymansville, R. I., is to be enlarged. One building, 150x100 feet, three stories high, is to be erected. The machinery and extension will cost about $80,000, and all is to be ready for work by the first of next January. Two hundred additional operatives will be employed.

Manning, Maxwell & Moore, 111 Liberty street, New York, have just received an order for all the machinery and tools to go into the new shop of the Sprague Motor Company, New York city. This company makes an electric motor which has been tried on the elevated road of New York city.

Marshall & Coleman, hat manufacturers, are to build a factory in Fall River, Mass., which is to be 270 feet long by 40 feet wide and two stories high. It will have an ell for a dye-house, an engine of 30 horse-power and a boiler of double that capacity. They expect to employ 50 girls and 300 men.

The Building Committee of the West Brookfield (Mass.) boot shop have contracted with J. A. Conway to put up a building for their use to be finished January 1. The dimensions of the building are: Boot shop, 136 feet by 18; boiler room, 28 feet by 18; shed and barn, 36 feet by 32.

The new furnace now almost completed at Jones & Loughlin's Eliza plant, Pittsburgh, will be the largest in Pittsburgh—perhaps in the country. When ready for blast, it will have cost upward of $200,000. It is 95 feet high, with a 20-foot bosh and eight hot blasts. The smoke-stack runs up 175 feet.

The Arthurs Coal and Lumber Company are enlarging their mill at Swissmont, Pa. They are setting an 18-inch Westinghouse engine, dispensing to a large degree with all shafting. Based on their past experience with this system, they expect to reach an average cut of 100,000 to 120,000 feet per day.

The Toledo Foundry and Machine Company, Toledo, Ohio, builders of excavating machinery, are preparing to replace their wooden buildings with a three-story brick and iron machine shop, the main parts of which will be 50 by 100 feet, and 62 by 65 feet respectively. They now employ 42 men, but expect to increase their force to 150 men.

The Ferracute Machine Company, of Bridgeton, N. J., report that prospects are good for a busy fall and winter. They make a specialty of presses, dies and other sheet-metal tools. Their new line of power punching presses has been well received, and they expect soon to add some new tools to their plant, which will materially facilitate the production of their goods.

Arrangements are being made to organize a new yarn mill in Fall River, Mass., with a capital of $250,000. A large part of the stock has been already taken, the largest subscribers being R. T. Davis, $30,000; Leander Freelove, $20,000; Frank S. Stevens, $10,000. Thomas R. Burrell will be treasurer of the new concern. The company will build a mill of $20,000 spindles. The location has not yet been decided on, but it will probably be in the eastern or southern part of the city.—*Boston Commercial Bulletin.*

The St. Joseph Lead Company have in course of construction at the works of the Rohan Brothers Boiler Manufacturing Company, at St. Louis, Mo., apparatus designed to make the extraction of lead from the ore a continuous single process, unhampered by jigging or crushing. This result is to be accomplished by heat, so graduated that it will barely melt the lead out of the ore and leave the slag to itself.

Randolph Brandt, manufacturer of the Selden packing, writes us: "I have just shipped to a large iron company in Ohio an unusually large size of the Selden patent packing, viz., three inches diameter. It is for hydraulic use, and I think speaks highly for the merits of the 'Selden.' Trade is very satisfactory, our orders keeping ahead of manufacturing, so that we cannot keep any amount of stock on hand."

The St. Louis *Age of Steel* says: "The Shellenberger Nut Lock Company, incorporated with a capital of $100,000 for the manufacture and sale of the Shellenberger nut lock, will open a factory in this city, but its general office will be in Dallas, Tex. The officers of the company are as follows: President, George Noble; vice-president, S. L. Shellenberger; secretary and treasurer, Benton Quick.

The Ireland Manufacturing Company, Cincinnati manufacturers of bronze builders' hardware, have about completed the erection of a new building, 75x40 feet, two stories high, on the lot adjoining their present factory site. They have also enlarged their foundry to thrice its former capacity, having put in three new furnaces, and have rearranged their manufacturing department, by which they are enabled to increase their working force by 75 additional hands.

The Warren Tube Company have recently been incorporated at Warren, O., with a capital stock of $200,000, for the purpose of manufacturing compressed iron and steel tubes. They expect to commence operations in January, 1887. The following officers have been elected: N. Monsarrat, president: T. M. Cornell, vice-president; J. H. Eaxon, Jr., secretary; Wm. A. Palmer and Winslow Alderdice, general manager.

Robert Whitehill, Newburgh, N. Y., builder of steam engines and ice machines, is erecting a pattern room, 53 by 65 feet, adjoining the foundry buildings put up by him some time ago, a couple of blocks from his present works, the ultimate intention being to remove his entire works. The foundry is 50 by 200 feet, one story, the latter being 23 feet high, adapting it for convenience in avoiding pit work, where long castings are required to be cast on end.

A Paterson (N. J.) silk firm is negotiating with Lancaster (Pa.) capitalists for the erection of a very extensive silk factory, to employ 500 hands and cost $75,000. Several new silk-manufacturing firms have recently started up. A large silk-throwing establishment is to double its capacity by building a large annex at Pittston, Pa. The rent is one-fourth of the Paterson rates, labor is one-third less taxes are merely nominal, and coal is one-fourth the Jersey price. These facts explain the general movement into the eastern Pennsylvania towns.—*Manufacturers' Gazette.*

J. P. Witherow has closed a contract with the Chicago Steel Company for a new steel plant to be erected at Hammond, Ind. The plant, when completed, will have a capacity of 150 tons a day, and its product will be steel nails, car axles and steel billets. The blooming and plate trains will be furnished by J. L. Lewis, of Pittsburgh; the furnace castings by the Altoona Car Works, of Altoona, Pa.; and four regenerative gas furnaces by M. V. Smith, consulting engineer of the company, who has his office in the Bissell Block, Pittsburgh. The plant will cost $157,000, and will be completed about February 15, 1887.—*Industrial World.*

Manning, Maxwell & Moore, 111 Liberty street, New York, have been awarded the whole contract for the machine tools for the large new shop of the Westinghouse Electric Co., of Pittsburgh. There was, of course, considerable competition for the order. The order is for lathes, planers, radial and upright drills, milling machines, shapers, etc. Some of the planers are as large as 72"x72". This firm also furnished (upon a single order) all the machinery for the new Northern Pacific Railroad Car Shops at St. Paul. Upon a visit to those shops, Mr. Cushing, the superintendent of motive power and machinery, informed us that he was well pleased with the satisfactory way in which all the details of that order had been carried out.

The rapid increase of business in the Boies—formerly the Dickson—steel wheel, together with the great increase of business in the locomotive department of the Dickson Manufacturing Co., Scranton, Pa., has made it necessary to establish a separate plant for the exclusive manufacture of the wheel. The ground is broken for a large and thoroughly-equipped shop, and it will be pushed rapidly to completion. The tools will be of the latest and best approved pattern. The hydraulic plant for flanging, stamping and corrugating the plates of this wheel has been especially designed for this purpose by the Niles Tool Company, Hamilton, Ohio, who are also arranging hydraulic cranes and hoists for handling the wheels, the service of tools, etc. To insure the same standard of excellence that has characterized this wheel in the past, Mr. Pierson, late foreman of the Dickson Company's shops, will take the superintendency of the works. So the wheels will be made under the same supervision, and largely by the same machinists. Col. Boies likewise expects to give the shops his personal attention.—*Railway Age.*

Machinists' Supplies and Iron.

NEW YORK, Nov. 11, 1886.

Iron—Transactions in American pig are mostly for small lots to meet current needs. There is no inclination to shade prices on the part of sellers, and buyers are not inclined to buy ahead. Lehigh and North River brands, No. 1 X Foundry, sell at $18.50 to $19; No 2, $17.50 to $18; Grey Forge, $16.25 to $16.50.

Scotch Pig—The demand for Scotch brands is slow, without variation in prices. We quote Coltness, $21.50 to $22; Glengarnock, $19.50 to $20; Gartscherrie, $20 to $21; Eglinton, $19 to $19.50; and Langloan, $21.

Lead—The market is quiet, but prices are held firm at recent advances. Sales have been made at 4.50c., but 4.45c. is nearer current price.

Antimony—There is no change in prices. Hallett's brand sells at 7.10c.; Cookson's, 9c.

WANTED

"Situation and Help" Advertisements only inserted under this head. Rate, 30 cents a line for each insertion. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

Wanted—Competent draftsman experienced in blast furnace and steel works construction; state experience. Address G. L., AM. MACHINIST.

Wanted — Situation as foreman boilermaker; used to handling 75 to 100 men; will take job laying out work; good references. Address W. F., AM. MACHINIST.

Machinist foreman wanted, who can handle fifty men to advantage, and increase their production by latest improved ways of doing work. Address P., care Wilkinson & Co., 352 Atlantic av., Boston, Mass.

Wanted—A young man to act as foreman of a machine shop; must be conversant with engine and pump work. Address, with references and age, to F. B. F., Box 71, Waterbury, Conn.

Wanted—By an experienced mechanic, familiar with designing and construction of automatic, high-speed and hoisting engines, also heavy tools, situation as foreman or superintendent; competent to manage men; good references. J. C. E., AM. MACH.

MISCELLANEOUS WANTS.

Advertisements will be inserted under this head at 35 cents per line, each insertion.

Gerlach's Engineers' Specialties beat the world. Send for price list. Crescent Mfg. Co., Cleveland, O.

Crescent grease cup for shafting beats them all. Sample free. Crescent Mfg. Co., Cleveland, Ohio.

Light mach'y of all kinds built at short notice. Edmund Mills, 8 Dey st., Jersey City Heights, N. J.

"Steel Stamps, &c." Agents wanted in every shop; send for terms. J. E. Mathewson, Springfield, Mass.

Wanted—Second-hand Cushioned Hammer, in good condition. Address Pennock Bros., Minerva, O.

John Lamberty, mfr. telegraph and electrical instruments, experimental machs, models; fine gear cutting a specialty. 35 S. 5th st., Br'kl'n, E.D., N.Y.

Special tools and machines for mfg. designed and built to order; mechanical and Patent Office drawings. Weston & Smith, Syracuse, N. Y.

Experimental and new machinery for special purposes built by contract from specifications and inventors' designs; ample facilities. Cohoes Iron Foundry and Machine Co., Cohoes, N. Y.

For Sale—One complete set of Pulley Patterns; also Patterns for Slide Valve Engines, with adjustable cut-off and without cut-off, for sale cheap. Address North Star Iron Works Co., Minneapolis, Minn.

For Sale, Cheap—Machine Shop, including lots, buildings, machinery, etc., all new, situated in Montoursville, Lycoming Co., Pa., on Reading R.R.; reason for selling, death of partner. Apply to Jacob J. Moltz, Williamsport, Pa.

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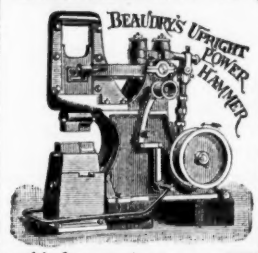

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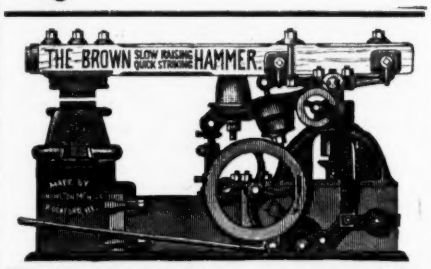

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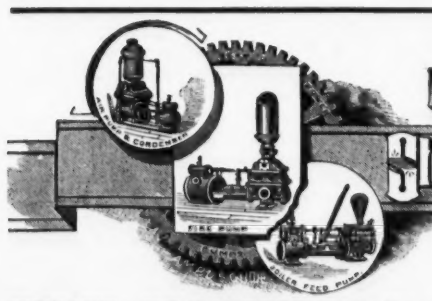

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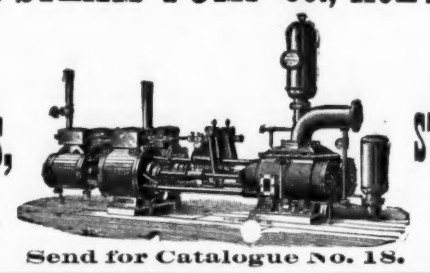

Send for Catalogue No. 18.

We present herewith a complete List of Orders for the Westinghouse Engine, received by us, from the NEW ENGLAND AND MIDDLE STATES ONLY, in the sixty days from Sept. 6th to Nov. 6th, 1886. FACTS ARE STUBBORN THINGS, and it remains only for us to express our high appreciation of the confidence with which the public has honored us.

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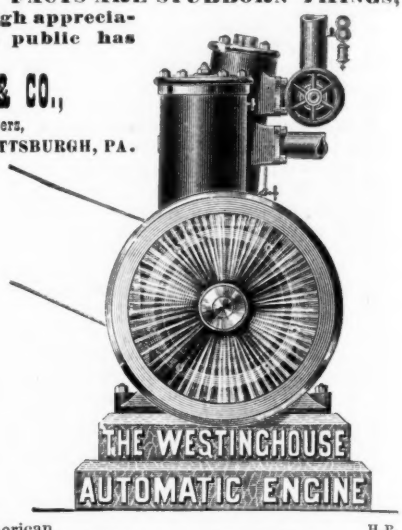
Contracting and Consulting Engineers,
17 Cortlandt St., NEW YORK. 98 4th Ave., PITTSBURGH, PA.



			H.P.
Westinghouse Electric Co	2d order,	Pittsburgh, Pa.,	200
National Dredging Co.		New York,	200
Pittsburg Electric Light Co.		Birmingham, Pa.,	150
do. do.	2d order,	"	150
Westinghouse Illuminat'g Co.	3d order,	Schenectady, N.Y.,	150
Lynn Electric Light Co.	5th order,	Lynn, Mass.,	100
Union Switch & Signal Co.	5th order,	Pittsburgh, Pa.,	100
Electric Light, Heat & Power Co.		Carbondale, Pa.,	100
do. do.	2d order,	" "	75
Union Switch & Signal Co.	6th order,	Pittsburgh, Pa.,	75
Pennsylvania R.R.		Altoona, Pa.,	75
East End Electric Light Co.	2d order,	Pittsburgh, Pa.,	75
do. do.	3d order,	" "	75
F. A. Robbins.		Pittsfield, Mass.,	60
T. C. Jenkins		Pittsburgh, Pa.,	60
Brush Electric Light Co.	17th order,	Buffalo, N. Y.,	60
do. do	18th order,	" "	60
Geo E. Voorhees.		Morristown, N. J.,	60
Penn'a Steel Co.	6th order,	Steelton, Pa.,	60
Adams Ex. Co.	2d order,	New York,	60
U S. Gov't Tender "Lucerne"	12th order,	Balt., Md.,	50
J. W Shanley, Saw Mill		Bridgeport, Conn.,	50
J. Leggett & Son, Paper Boxes.	3d order,	Troy, N. Y.,	45
People's Electric Light Co.		Greensburg, Pa.,	45
do. do.	2d order,	"	45
Danville Nail Mfg. Co		Danville, Pa.,	45
Pencoyd Iron W'ks.		Philadelphia, Pa.,	45
State Insane Asylum.		Marion, Va.,	45
do. do	2d order,	" "	45
J. C. Livingston & Co., Saw Mill		Little Falls, N. Y.,	45
Philadelphia "Ledger"		Philadelphia, Pa.,	95
do.	2d order,	" "	35
do.	3d order,	" "	35
do.	4th order,	" "	35
Van Deventer & Horne, Hosiery Mill.		Plainfield, N. J.,	35
Winona Paper Co.	3d order,	Holyoke, Mass.,	35
Nicholas Hotton.		Partville, N. Y.,	35
Ramapo Iron Works.		Hillburn, N. Y.,	35
Wm. Broadhead & Sons.	6th order,	Jamestown, Pa.,	35
do.	7th order,	" "	25
Brainerd & Shepard		Albany, N. Y.,	25
Rumford Chemical Works		Providence, R. I.,	25

			H.P.
American Press Association		New York,	25
C. F. Davis, Paper Mill.		Valatie, N. Y.,	25
Electrical Accumulator Co.		New York,	25
E. L. Tunis & Co.		Baltimore, Md.,	25
Crane Bros., Paper Mill.	2d order,	Westfield, Mass.,	20
Howard Iron Works.	2d order,	Buffalo, N. Y.,	20
Thos Henshell, Silk Mill		Paterson, N. J.,	15
Newton Machine Tool Works.		Philadelphia, Pa.,	15
Utica Cas Light Co.	2d order,	Utica, N. Y.,	15
Thompson Mfg. Co.		Lancaster, N. H.,	15
Keystone Electric Light Co.	4th order,	Philadelphia, Pa.,	15
Marton Bros.		Taunton, Mass.,	15
D. A. Hopkins.		Jersey City,	15
Youghiogheney Coal Co		Pittsburgh, Pa.,	15
E. D. Clapp Mfg. Co.		Auburn, N. Y.,	15
Hudson River Paper Co.		Mechanicville, N.Y.	15
Philadelphia "Ledger,"	5th order,	Philadelphia, Pa.,	10
Worcester Gas Co.	2d order,	Worcester, Mass.,	10
S. N. Boyd & Co.		Richmond, Va.,	10
Worthy Paper Co.		Springfield, Mass.,	10
Johnstown Gas Co		Johnstown, Pa.,	10
Phœnix Insurance Co.		Hartford, Conn.,	5
C. Fred. Ruhlman.		Trenton, N. J.,	5
W. A. Andrews.		New York,	5
J. Forward.		Shippensburg, Pa.,	5
TOTAL, SIXTY-SEVEN ENGINES, (H. P.),			3,155
AVERAGE SIZE		(")	47

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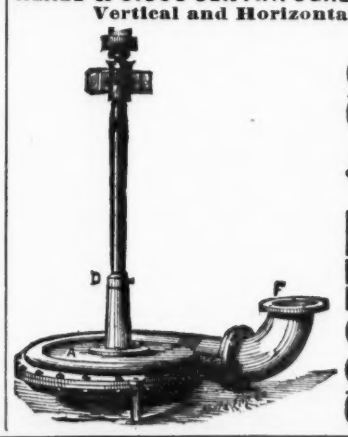

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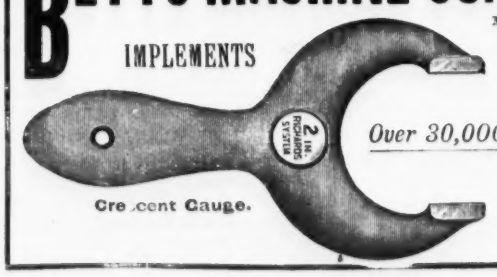

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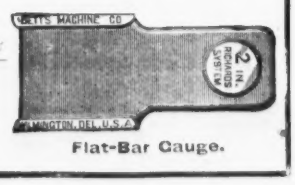

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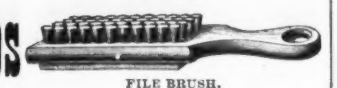
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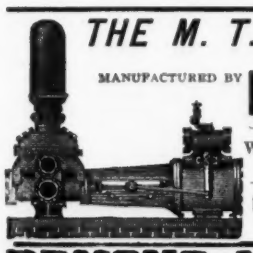

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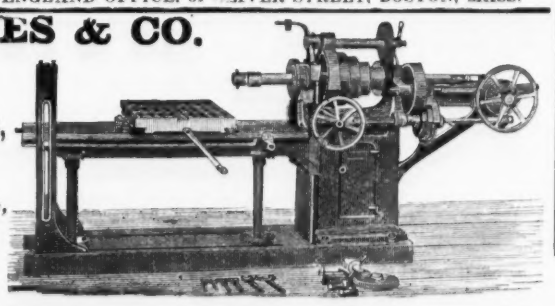

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2	1/2	.35	Small Set of 8		5.50
3	3/4	.50	9	2 1/2	1.40
4	1	.60	10	3	1.50
5	1 1/4	.75	11	3 1/2	1.70
6	1 1/2	.85	12	4	1.90
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A LOSS PAID ON A BABCOCK & WILCOX BOILER, WHICH IS CLAIMED TO BE NON-EXPLOSIVE AND ABSOLUTELY SAFE.

OFFICE OF BROOKLYN SUGAR REFINING CO.,
BROOKLYN, N. Y., October 20, 1886.

American Steam Boiler Insurance Company.

GENTS: We desire to express to you our gratification and our thanks for the prompt manner in which the recent loss was adjusted upon one of our Babcock & Wilcox boilers, having received within two hours after rendering proof of loss to you the full amount of our demand for the damage to our boiler, and also the payment of the claim of Patrick Stapleton, one of our workmen, who was scalded by the escaping steam.

Yours truly
BROOKLYN SUGAR REFINING CO.
J. A. STURSBERG, Secretary.

It seems to be a settled policy of all Boiler Insurance Companies to discourage the use of Safety Boilers, as the fear of explosion is the greatest inducement to take out policies. But the apparent reason of publishing and sending the above notice with the following words in large type: "A loss paid on a Babcock & Wilcox Boiler, which is claimed to be non-explosive and absolutely safe," is evidently grudge or spite, accounted for mainly from the fact that at one time they endeavored to have the BABCOCK & WILCOX CO. treat with them for a general line of insurance on all of their manufactures, which was declined by this Company, on the ground that they had no confidence either in the stability of the company or the honesty of its management. The departure of the treasurer of said Insurance Company soon thereafter for Canada, where he has since, as far as known, remained, shows that the opinion of the BABCOCK & WILCOX CO. was not without foundation.

The following letter shows the actual facts in the case referred to:

OFFICE OF BROOKLYN SUGAR REFINING CO.,
BROOKLYN, N. Y., October 30, 1886.

Messrs. The Babcock & Wilcox Co., New York:

GENTLEMEN: In reply to yours of 29th inst., would say that we sincerely regret that our letter of 20th inst. to the American Steam Boiler Insurance Company should in any way reflect upon the quality of your boilers, as we certainly did not intend to convey any such impression. Our high opinion of your boilers we believe to have demonstrated thoroughly by the repeated orders that we have given you since 1876.

The unfortunate accident referred to was caused by the negligence of our man in charge of the boilers, who was consequently, after proper investigation, promptly discharged for allowing the water to get low. This caused several tubes to be badly burned and ruptured, which was the only damage done to property.

The injury done to Patrick Stapleton by the escaping steam was fortunately so slight that he was enabled to return to work on the second day following the accident.

We shudder to contemplate what the result would have been had we had in use any other style of boiler.

Yours truly,
BROOKLYN SUGAR REFINING CO.,
JOHN A. STURSBERG, Secretary.

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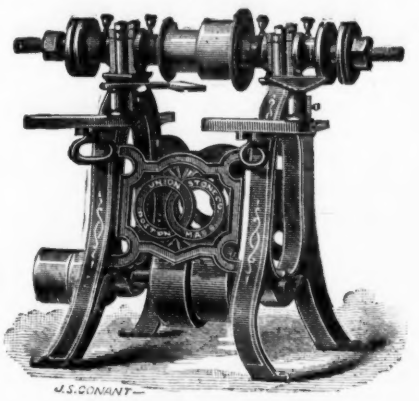

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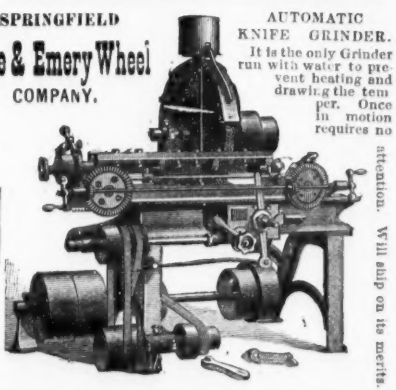

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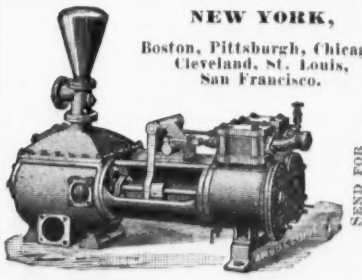

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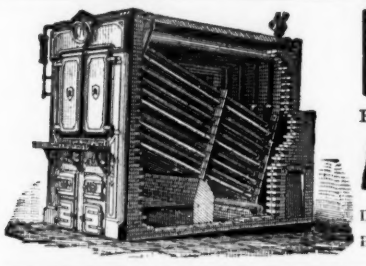

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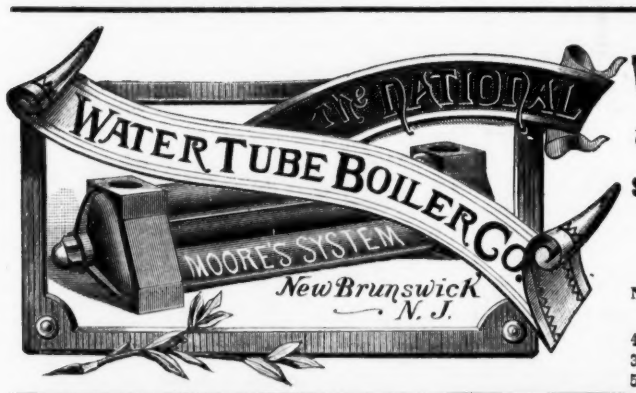

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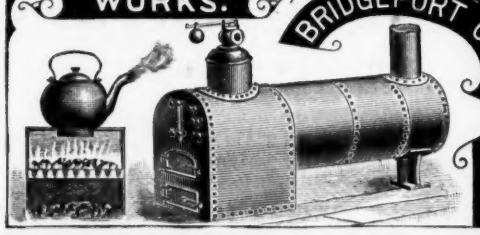

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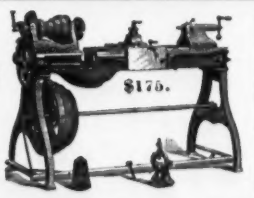

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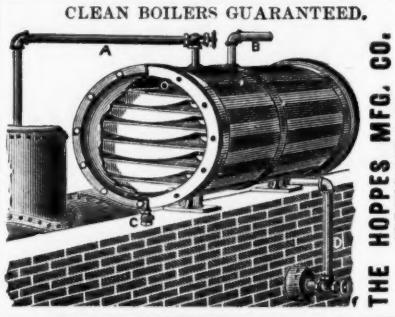

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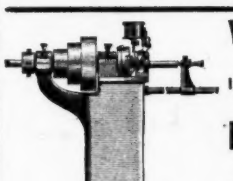
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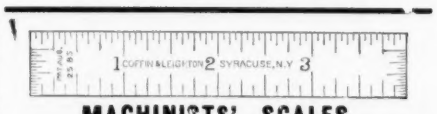

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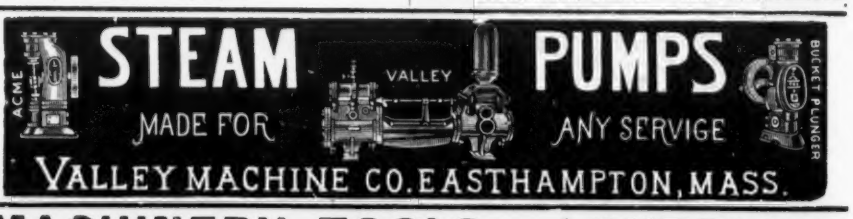

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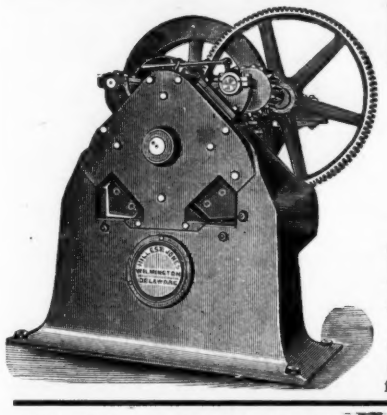

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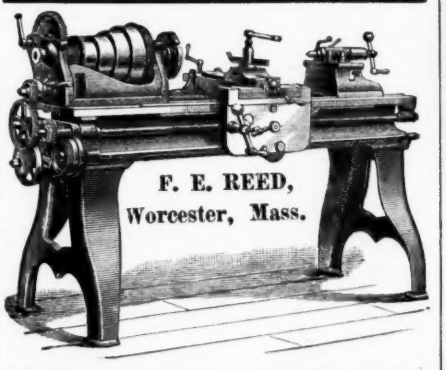

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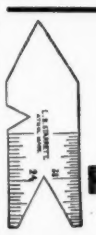

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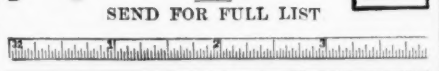

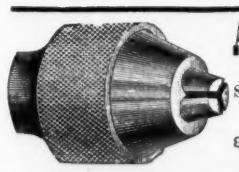

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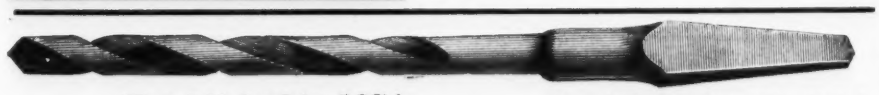

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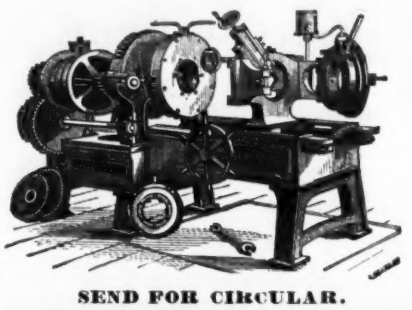

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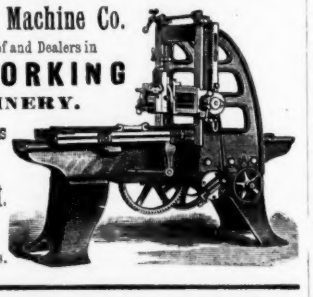

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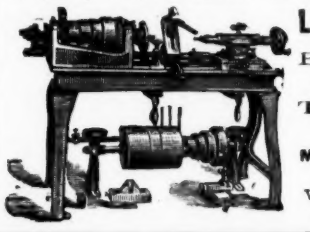

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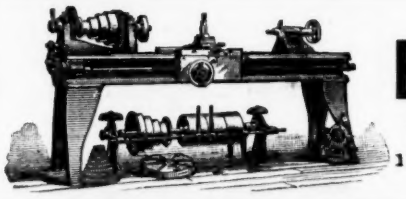

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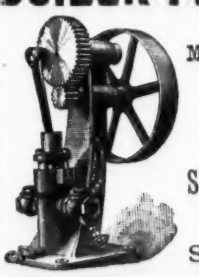

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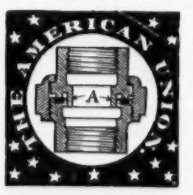

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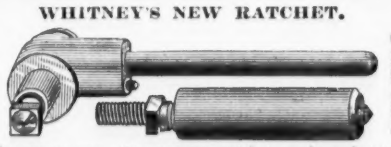

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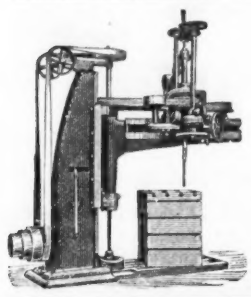

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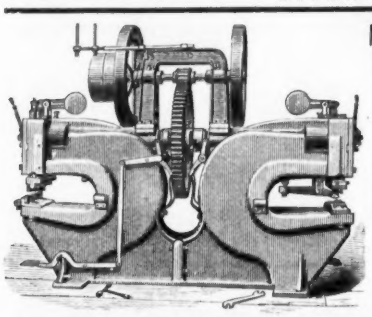

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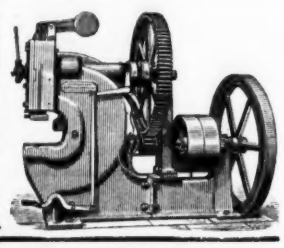

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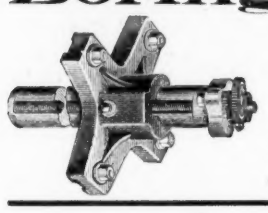

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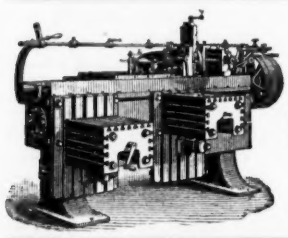

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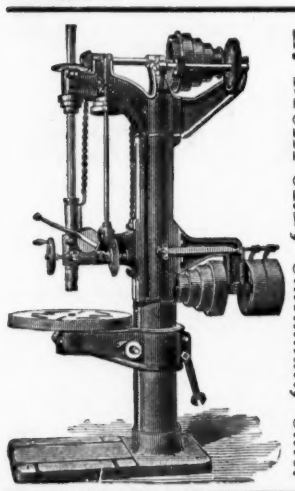

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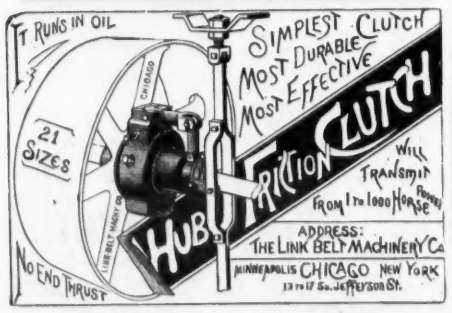

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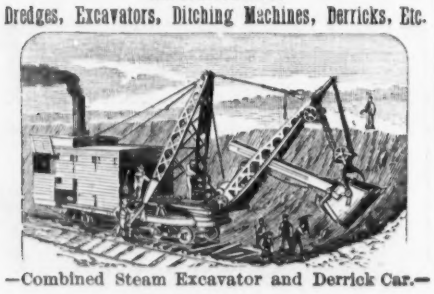

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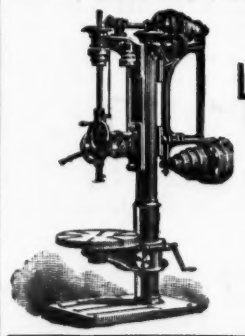

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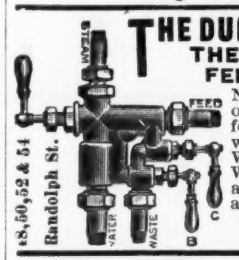

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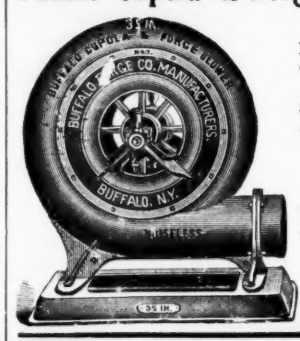

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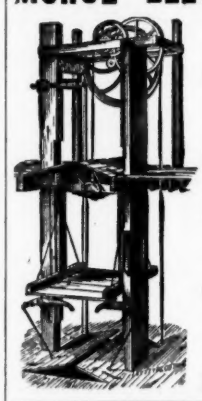

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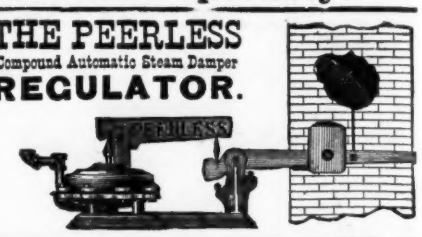

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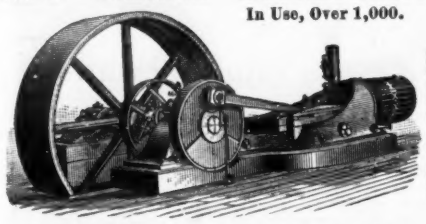

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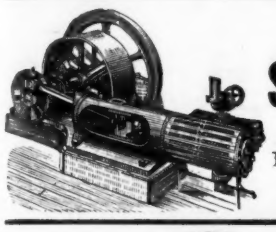

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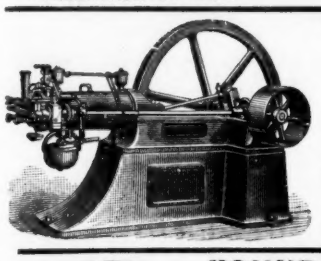

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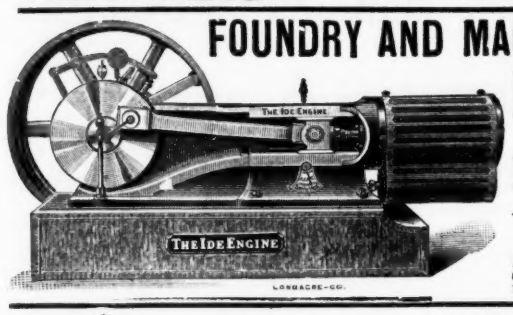

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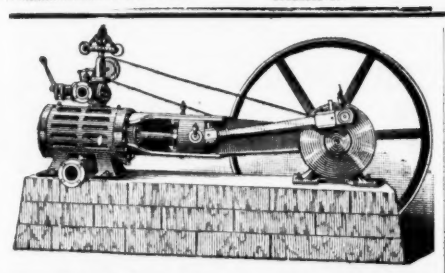

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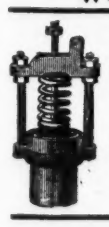

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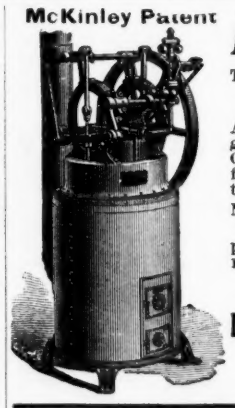

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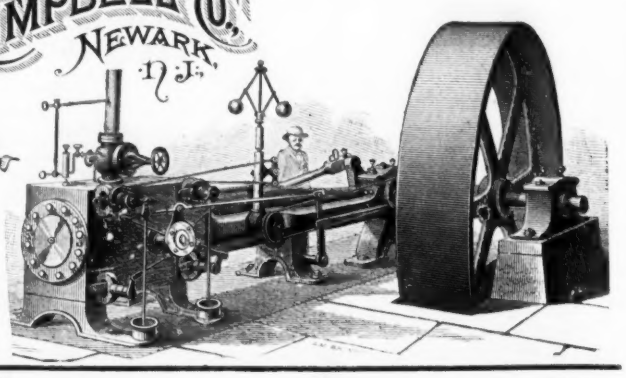

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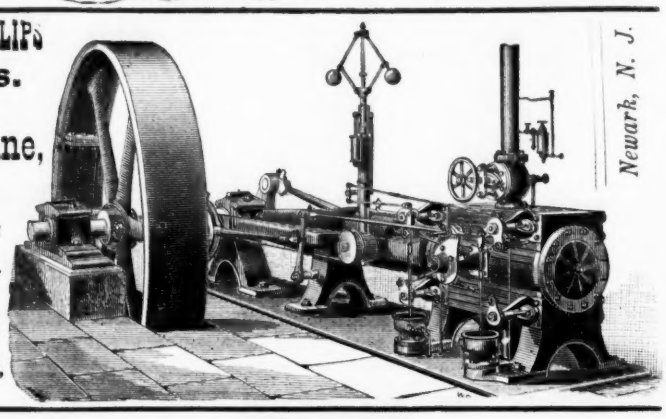

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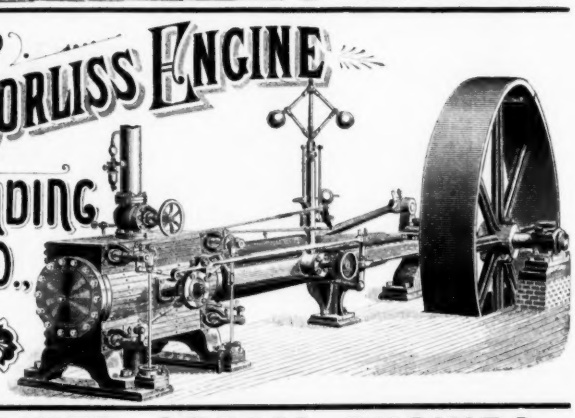

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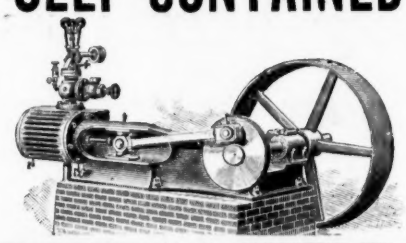

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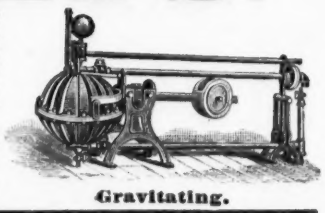

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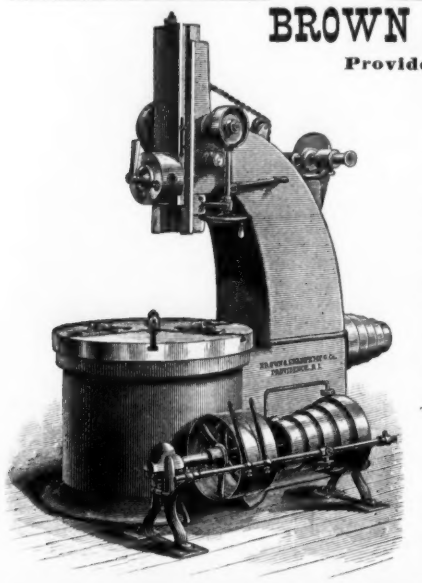

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The Revolving Table is driven by a 5-step cone for 3-in. belt, and geared 6 to 1. Steps of cone so graded as to make cutting speed uniform for 5 different diameters of holes.

The Turret has 4 holes 1 3-4 in. in diameter, and is securely clamped in position. An adjustable dog allows the locking pin to be withdrawn at any part of its upward motion.

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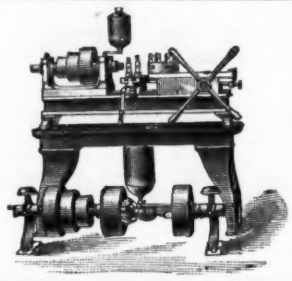

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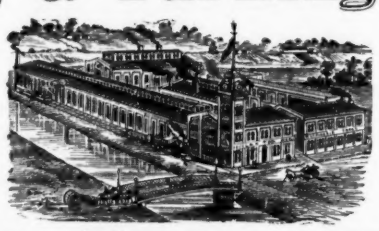

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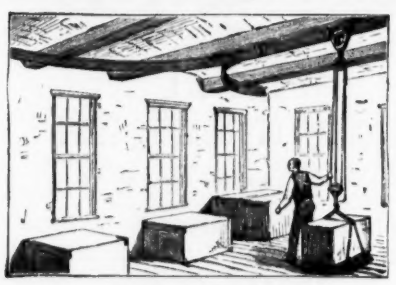

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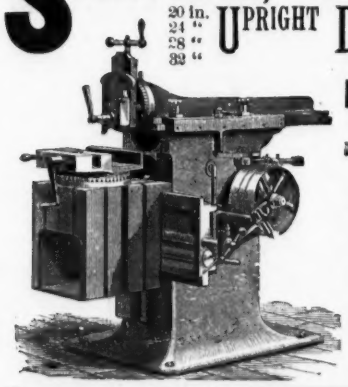

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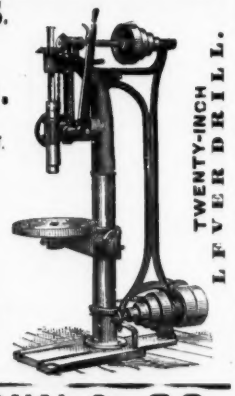

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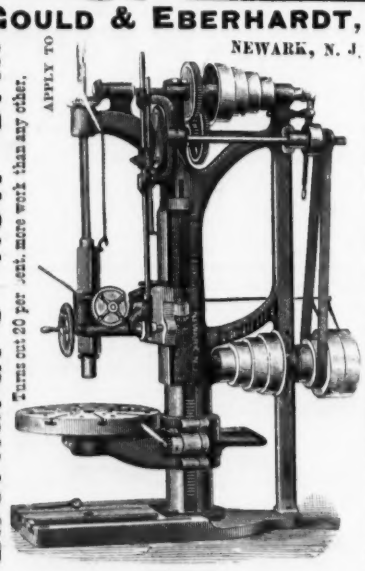

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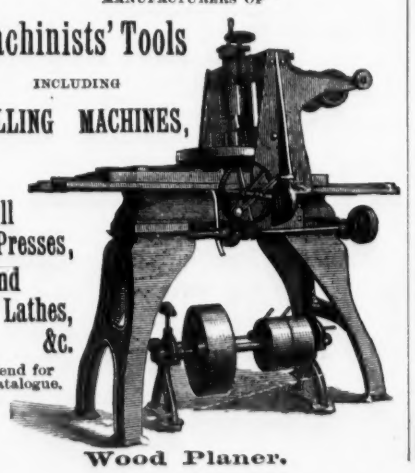

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